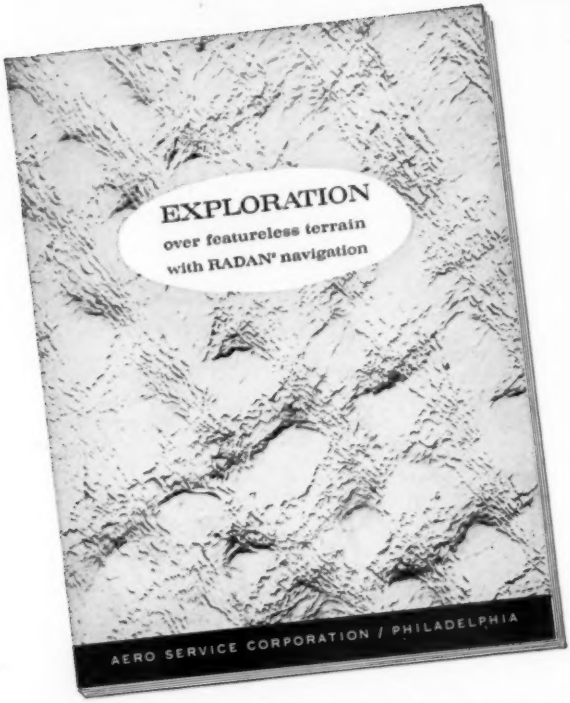
Surveying and Mapping

UNIVERSITY OF MICHIGAN
MAR 31 1960
ENGINEERING LIBRARY

March 1960

Quarterly Journal

AMERICAN CONGRESS ON SURVEYING AND MAPPING



Now starting second 100,000 miles of RADAN® DOPPLER navigation

In the past 18 months, Aero Service has completed 100,000 miles of Radan guided surveys over featureless terrain. Included in this tally are 40,000 miles over the Sahara desert and 60,000 miles over Surinam's dense jungle cover.

Aero Service flew the first Radan Doppler survey in July, 1958. It is the first and only air survey company to use Radan Doppler. New "Radan 500"—even more advanced—is now approaching production. Aero will have its "500" units tested and ready for use early in 1960.

Aero offers you solid operational experience and skills plus the finest Radan gear. Let Aero bring its broad experience to bear on your exploration and surveying problems.

Write today for **Exploration over Featureless Terrain with Radan Navigation.** It reports costs, accuracies and other important data.

aero service corporation

210-D E. Courtland St., Philadelphia 20, Pa.

Organization of the Congress

OFFICERS FOR 1960

President

H. ARNOLD KARO
Bethesda, Md.

Vice President

B. AUSTIN BARRY
New York. N. Y.

Executive Secretary

WALTER S. DIX
Maps and Surveys Division, TVA

Treasurer

HENRY W. HEMPLE
U. S. C. & G. Survey, (Ret.)

BOARD OF DIRECTORS

(Terms expire 1960, 1961)

W. B. WILLIAMS	1960
C. J. AGGELER	1960
WILLIAM C. CUDE	1960
JOHN A. LAW	1960
CLIFFORD A. THORPE, JR.	1960
JAMES P. WEBB	1960
GEORGE C. BESTOR	1961
RALPH MOORE BERRY	1961
DUNCAN M. FITCHET	1961
VICTOR H. GHENT	1961
ROLAND H. MOORE	1961
ALFRED O. QUINN	1961

PAST PRESIDENTS

ROBERT H. RANDALL
JOHN S. DODDS (Deceased)
GEORGE D. WHITMORE
FRANK S. BORDEN
MARSHALL S. WRIGHT
SOL A. BAUER
GERALD FITZGERALD
GEORGE H. HARDING
REAR ADM. R. F. A. STUDDS
CARROLL F. MERRIAM
LESTER C. HIGBEE
ROBERT H. LYDDAN
W. B. WILLIAMS
GEORGE C. BESTOR

CHAIRMEN, TECHNICAL DIVISIONS

GRANVILLE K. EMMINIZER, *Cartography*
RICHARD G. WATTS, *Control Surveys*
FRANCIS H. MOFFITT, *Education*
CLIFFORD A. THORPE, JR., *Instruments*
A. PHILLIPS BILL, *Property Surveys*
CHARLES W. BUCKEY, *Topography*

CHAIRMEN, STANDING COMMITTEES

GEORGE C. BESTOR, *Executive*
JOHN M. AMSTADT, *Budget*
FRANK S. BORDEN, *Membership*
LESTER C. HIGBEE, *Professional Status*
CHARLES A. WHITTEN, *Publications*
HELMUTH BAY, *Public Relations*
G. K. EMMINIZER, *20th Annual Meeting*

ADVISORY COUNCIL

C. C. LINDSAY
WILLFRED B. WILLIAMS
WILLIAM C. WATTLES
J. S. BEAZLEY

PUBLICATIONS COMMITTEE

CHARLES A. WHITTEN, *Chairman*
FRANK S. BORDEN (*General*)
ROBERT C. ELLER, (*Property Surveys*)
LYMAN D. LYNN (*General*)
C. S. MALTBY (*Instruments*)
MARVIN C. MAY (*Education*)
WALTER W. RISTOW (*Cartography*)
H. P. KAUFMAN (*Control Surveys*)
EDMUND SWASEY (*Topography*)

NOTE:—Manuscripts of articles should be addressed to Chairman Whitten, Coast and Geodetic Survey, Department of Commerce, Washington 25, D. C.

EDITORIAL STAFF

HOWARD S. RAPPLEYE, *Editor-in-Chief*
JOHN B. ROWLAND, *Assistant Editor*
A. J. WRAIGHT, *Assistant Editor*

American Congress on Surveying and Mapping

The American Congress on Surveying and Mapping is a non-profit association, organized to advance the sciences of surveying and mapping in their several branches, in furtherance of the public welfare and in the interests of both those who use maps and surveys and those who make them. It aims to establish a central source of reference and union for its members, to contribute to public education in the use of surveys and maps, and to encourage the prosecution of basic surveying and mapping programs, especially those programs which are paid for, in whole or in part, with public funds.

SURVEYING AND MAPPING is the official journal of the Congress and is published quarterly during the months of March, June, September, and December. The Congress welcomes articles and interesting news items for publication in its journal. Manuscripts should be sent to the Chairman of the Publications Committee.

For further information, write to

ACSM Central Office, 905 Washington Bldg., 1435 G St., N.W., Washington 5, D. C.

ADVERTISING IN SURVEYING AND MAPPING

To assist members to keep abreast of new developments in surveying and mapping instruments and equipment, and to afford suppliers of such items an advertising medium ideally suited for their market, the pages of SURVEYING AND MAPPING are open to commercial advertising. For rates and data, write to Advertising Department, SURVEYING AND MAPPING (Schaler Butler Associates), 1028 Connecticut Avenue, N.W., Washington 6, D. C.

INDEX TO ADVERTISERS

Abrams Aerial Survey Corporation	14	Leo Jean Goldsmith	19
Aero Service Corporation	Cover 2	W. & L. E. Gurley	4
Wm. Ainsworth & Sons, Inc.	142	Kern Instruments, Inc.	16
Air Photo Supply Corp.	143	Keuffel & Esser Co.	21, 88 & 89
American Air Surveys, Inc.	142	Monsen Typographers, Inc.	6
American Paulin System	Cover 4	The A. Lietz Co.	9
Aqua Survey & Instrument Company	108	OMI Corporation of America	18
Bathey Manufacturing Company	8	Park Aerial Surveys, Inc.	125
Bausch & Lomb Optical Co.	17	State Boat Corporation	142
C. L. Berger and Sons, Inc.	15	Surveyors Service Co.	34 & opp. 48
Bobbs-Merrill Company, Inc.	108	Technical Advisors, Inc.	140
F. W. Breithaupt & Sohn	20	Tellurometer, Inc.	10 & 11
James D. Carter	126	Unitech Corporation	7
Crown Metal Products Co.	140	Universal Instrument Company	20
Eugene Dietzgen Co.	19	Victor Tool Company	108
J. A. Engel, Inc.	9	Warren-Knight	7
Fairchild Aerial Surveys, Inc.	22	John Wiley & Sons Inc.	141
Fennell Instrument Corp. of America	141	Wild Heerbrugg Instruments Inc.	Cover 3
Geodimeter Co.	13	Zeiss-Aerotopograph	12

SURVEYING AND MAPPING is published quarterly by the AMERICAN CONGRESS ON SURVEYING AND MAPPING, Box 470, Benjamin Franklin Station, Washington 4, D. C. Yearly subscriptions to non-members: U. S. $5.00; foreign $6.00. Single copies $1.50 plus postage.

Entered as second-class matter at the Post Office at Washington, D. C., November 13, 1944, under the Act of March 3, 1879. Accepted for mailing at special rate of postage August 7, 1958 Additional entry as second-class matter at the Post Office at Lancaster, Pa

SURVEYING AND MAPPING

Editor-in-Chief
Howard S. Rappleye

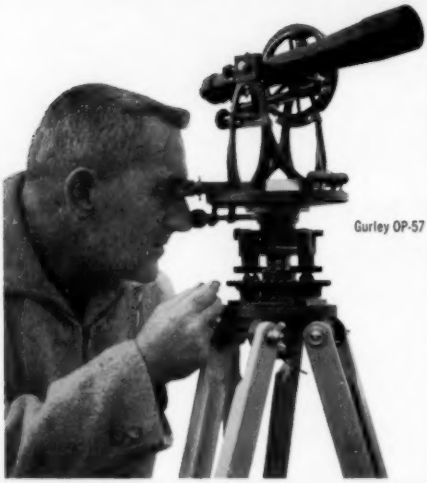
A QUARTERLY JOURNAL
DEVOTED TO THE ADVANCEMENT OF THE SCIENCES
OF SURVEYING AND MAPPING

Volume XX, No. 1
March 1960

PUBLISHED BY THE
AMERICAN CONGRESS ON SURVEYING AND MAPPING
BOX 470, BENJAMIN FRANKLIN STATION, WASHINGTON 4, D. C.

ACSM CENTRAL OFFICE IS LOCATED AT 905 WASHINGTON BUILDING,
1435 G STREET, N.W., WASHINGTON 5, D. C.

Built-in optical plummets eliminate plumb bobs save set-up time...improve accuracy



Gurley OP-57

Gurley OP-137

The Gurley Optical Plummet Transit (Model OP-57) has proved itself to be such an important time and money saver in the field that this optical plummet feature has also been added to the Model 132 Standard Precise Transit. The new transit will be known as the OP-137.

Both these Optical Plummet Transits will save you time and trouble in setting over a point. The OP-57 and OP-137 eliminate the swing and sway of the cord and plummet—exasperating and time consuming. You will especially appreciate the increased accuracy on windy locations.

By rotating the instrument 180°, you can be assured of positive centering.

The Gurley Optical Plummet Transits are furnished with tripods which have built-in shifting heads. They allow a two-inch shift of instrument over the point, providing greater latitude in initial set-up.

Model OP-57 is recommended for very exacting work; the OP-137 for general engineering and construction work because of its shorter telescope, smaller size and its lighter weight.

Now in *two* models Gurley offers you an important advantage of the optical-reading theodolite *plus* the simplicity, ruggedness and proved performance of the American transit. *Write for new Bulletin OP-100.*

W. & L. E. Gurley
Engineering Instruments Division
Troy, New York
Since 1845

GURLEY

W. & L. E. Gurley, Engineering Instruments Division
530 Fulton St., Troy, N. Y.

Please send new bulletin OP-100 with details on Gurley's Optical Plummet Transits.

NAME _____

TITLE _____

ORGANIZATION _____

ADDRESS _____

CITY _____ ZONE NO. _____ STATE _____

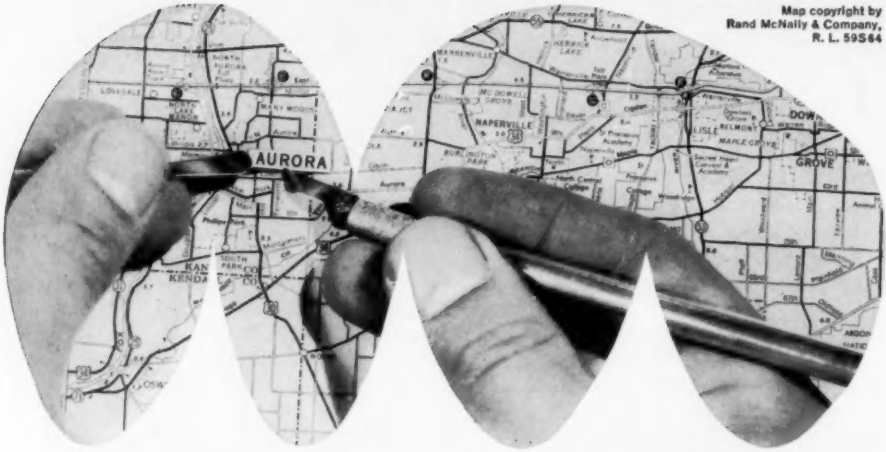
March • 1960

Contents

Volume XX, No. 1

Organization of the Congress 1
Index to Advertisers 2
Ethiopian Geodetic Expedition 23
Don A. Jones
Circular Area Segment Formulas 32
Paul J. Dowling
Survey Control for the Feather River and Delta Diversion Projects 35
Tracy L. Atherton
Notes on the Impossible 43
Erwin Schmid
Surveying Equipment Under Development for the Army 45
Leonard W. Andrukonis
Geodimeter NASM4 49
J. Boyle
Random Lines on Map Drafting 53
John E. Asher
The Status of Education in Surveying 55
Russell C. Brinker
Audio-Visual Aids on Surveying, Mapping, and Photogrammetry 67
Kenneth S. Curtis
The Value of Cartobibliographies and the Technique of Their Compilation 76
Edward L. Chapin, Jr.
Surveying and Mapping Literature 85
Distinctive Recent Maps 90
The Surveyor and the Law 92
Books in Review 95
Abstracts of Articles on Geodesy and Related Fields 99
Map Information 109
Comment and Discussion 115
News of Related Organizations 117
Congress News 121
New Members 127
Annual Financial Statement 130
Congress Directory 131
Sustaining Members 132
Application for Membership 144
Notice on Ordering Reprints 144

Opinions or assertions expressed in articles in this Journal do not necessarily represent the official views of the Congress.



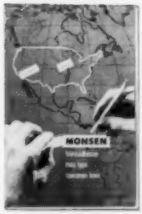
MONSEN MAP TYPE
for fast, legible detailing

Monsen Trans-Adhesive® Map Type is prepared to your specifications. Names, numerals, symbols and small cartographic details are precisely printed on acetate. You simply place in position and burnish. A clear, pressure-sensitive adhesive backing holds each detail in place until you want it removed. Letters and symbols are razor-sharp—never leave room for misinterpretation.

TWO KINDS:

Monsen Regular Trans-Adhesive Map Type for maps and charts which will be reproduced by a "cool" method such as photography or contact in a printing frame.

Monsen H-R Heat Resisting Trans-Adhesive Map Type for maps and charts which will be subjected to heat in a Bruning, Ozalid or blueprinting machine.



FREE TYPE SPECIMEN BOOK AND SAMPLES

See map type faces and symbols. Test samples of both Regular and H-R Heat Resisting Trans-Adhesives. Price list included.

Monsen *typographers, inc.*

CHICAGO 11, ILL.—22 EAST ILLINOIS STREET
LOS ANGELES 15, CALIF.—960 WEST 12TH STREET

Ethiopian Geodetic Expedition

By DON A. JONES*

COAST AND GEODETIC SURVEY

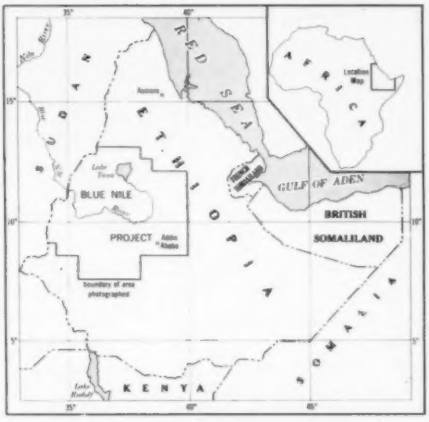
SPECIFICATIONS for the geodetic control project of the Blue Nile River Basin Investigation in Ethiopia required that geodetic connections be made to horizontal and vertical control that existed in the adjacent Sudan. Accordingly, an expedition from Ethiopia was organized to undertake the geodetic surveys by extending the Sudanese triangulation and leveling into Ethiopia and thence into the Blue Nile River Basin. Unique operational conditions contrived to make the project unusually interesting.

The Blue Nile River Basin Investigation in Ethiopia is being conducted by the Imperial Ethiopian Government (IEG), assisted by the United States International Cooperation Administration (ICA). The Department of Water Resouorces and Surveys of the IEG Ministry of Public Works administers the investigation jointly with an ICA Program for Water Resources. The investigation is divided into three major projects: (1) Resources Survey, (2) Geodetic Control, and (3) Mapping. The U. S. Bureau of Reclamation, by agreement with ICA, is furnishing engineers and technicians for the Resources Survey Project; the Mapping Project consists of photogrammetric work on the series of aerial photographs produced under the technical direction of the Army Map Service, Corps of Engineers, U. S. Army.

The Coast and Geodetic Survey, U. S. Department of Commerce, also by agreement with ICA, is furnishing 12 technicians for the supervision of the Geodetic Control Project. The Department of Water Resources of the IEG Ministry of Public Works is furnishing an additional 72 employees for the geodetic project, consisting of civil engineers, trainees, and supporting personnel.

* Commander, U. S. C. & G. S., Chief of Party, Ethiopian Geodetic Control Project.

The geodetic project was started in April 1957 upon the arrival in Ethiopia of the first contingent of U. S. Coast and Geodetic Survey technicians. Several months were required to organize the project, procure instruments and equipment, recruit and train Ethiopian personnel, and obtain helicopters for the support of the operations. Actual



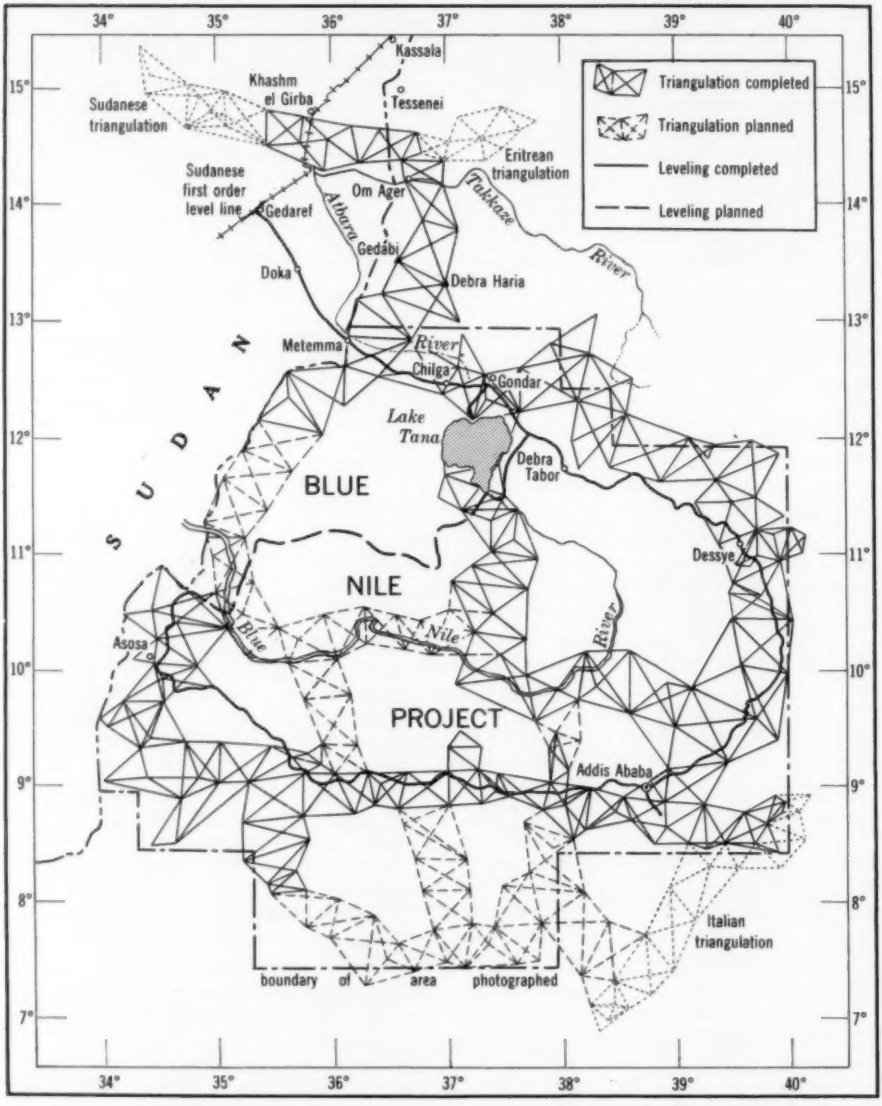
THE BLUE NILE PROJECT IN ETHIOPIA.

full scale field operations could not be started until November 1957. First-order triangulation and leveling completed as of October 1959 are illustrated on the accompanying sketch. By September 1958 the field crews were sufficiently organized and indoctrinated to attempt the Sudan connections called for in the geodetic control project specifications.

An over-all estimate of the situation confronting the project in 1957 indicated that the Sudan connections could be best accomplished during October–December when the average highest maximum temperatures could be expected to be only about 100° F., and when the "dry weather" roads in the areas on both sides of the Ethiopia-Sudan border were passable. Towns and villages

with water supply were generally located so as to be convenient bases of operations. The highway from Asmara to Tessenei and across the border to Kassala, Sudan, was found to be hard surface and, although abrasive, would allow transportation via trucks from Asmara for heavy loads of helicopter gasoline, equipment, and food supplies.

The Ethiopian Air Lines airport at Tessenei with regular cargo and passenger plane service provided for emergency logistics for



STATUS OF ETHIOPIAN GEODETIC CONTROL PROJECT—OCTOBER 1959.

Bell 47J Helicopter being loaded with Triangulation Observing Unit equipment for transportation to 11,250-foot Mountain Peak Station.

the triangulation party. Ethiopian Air Lines helicopter support was also provided by the airport. The road south from Tessenei was passable as far as Om Ager and the Takkaze River, which could not be forded by vehicles until near the end of the dry season, usually February or March. This situation meant that the project would be forced to operate by helicopter transport only, in the area south of the river, since no known roads existed northwest of Gondar or north from Metemma along the border. It also meant that the triangulation party would be required to backtrack 1100 kilometers through Asmara to reach Gondar and points west to complete the surveys into the Blue Nile basin in the vicinity of Metemma.

Problems facing the leveling party were somewhat less imposing than those to be solved in carrying on the triangulation. All the level party had to do was reach Gedaref, Sudan, by truck from Asmara and proceed with leveling southeast toward Metemma along trails as indicated on existing maps. However, it was known that heavy trucks had not used the trail up the mile-high escarpment from Metemma to Gondar for a period of at least fifteen years, and how to supply the level party after it reached the border at Metemma was a problem yet to be resolved.

The general plan of operations for the triangulation connection called for a main base camp at Tessenei, Eritrea, and a subordinate camp at Khashm el Girba, Sudan. Triangulation operations were to start with a reoccupation of selected Sudanese stations and to continue eastward to the Eritrean border where a tie to Eritrean triangulation was to be made. After crossing the border into Ethiopia a taped first-order baseline was to be measured, plus a Laplace azimuth and first-order astronomic observations. The triangulation was then to continue south inside Ethiopia across the Takkaze River and follow the Ethiopia-Sudan border to vicinity of Metemma, and thence throughout the Blue Nile River watershed. The leveling, as mentioned previously, was to tie to Sudanese first-order spirit levels along the Sudan railway at Gedaref and thence southeast to Metemma and the watershed.

Diplomatic negotiations for permission to

undertake the surveys were initiated well in advance of the planned operations. These negotiations were conducted by the Imperial Ethiopian Government and the Sudanese Republic through official governmental channels and were assisted greatly by the excellent relations existing between His Imperial Majesty's Government and the Republic of Sudan. An agreement was reached whereby the survey parties could cross the border as required to undertake the work, and that passport visas, customs clearances, and various licenses and permits would be made available. Due to the unusually heavy rains in the area during the 1958 rainy season, the recommendation was made that the expedition postpone the beginning date to the latter part of October.

The final technical cooperation was planned early in September 1958 with the Sudan Survey Department. The Survey Department had completed the reconnaissance and constructed both triangulation stations and leveling bench marks along the proposed routes to the Ethiopian border. The descriptions of these stations and marks were furnished, as well as much information of a general nature to assist the expedition. Arrangements were made for the use of two Sudan Survey Department 103-foot steel observing towers and builders to assist with the erection. These towers were necessary at two stations, and the expedition was assured that the towers and men would be at Khashm el Girba when needed.

By the end of September 1958 triangulation in central Ethiopia along the southern main scheme arc of the Blue Nile watershed, Asosa to Addis Ababa, was completed, and the entire triangulation party assembled in Addis Ababa to complete preparations for the move to Tessenei. The leveling party was working on the line from Addis Ababa to Dessye and, since very little in the way of special preparations were required by the party, they continued field work on this line until about the middle of October. The first convoy of the triangulation party and the entire leveling party then proceeded toward Asmara and Tessenei. Several days were spent at Asmara in procuring food, fuel, and repairs, and also to make official calls on Eritrean government officials. Assistance was provided by the Eritrean office of the United States Operations Mission in Asmara.

Road between Lekempt and Ghimbi—March 1958.

The first units established a camp at Tessenei on 25 October and the last units of the project arrived in Tessenei one week later. Twenty-five vehicles, including four GMC trucks of World War II vintage, eleven Dodge power wagons, seven Land Rovers, and three Willys jeeps plus trailers made the 1450 kilometer trip over rough, hazardous, mountain roads without mishap other than flat tires, broken springs, and other minor disablements. Mechanics or drivers with considerable mechanical ability accompanied each convoy. When a jeep or lighter vehicle developed a flat tire, the Ethiopian and U. S. personnel would pour out of adjacent trucks and manhandle the vehicle onto blocks, rather than take the extra time to jack up the wheel.

Soon after arrival at Tessenei official calls were made on the Tessenei District Officer, and on police officials of the Agordat District and the Tessenei subdistrict. Captain Mahomed Saleh, Chief of the Tessenei police, was extremely helpful to the project. Among the many assistances that he provided was a 24-hour guard for the project camp which was continued during the entire stay of the party at Tessenei. The project was able to return these kind-

nesses in a small way by occasionally providing transportation for the police when vehicles were moving in the District.

During the latter part of October 1958 two helicopters arrived at the Tessenei camp. An American engineer and his Ethiopian assistants prepared gear and vehicles for steel tower building in Sudan. This working group, plus the chief of project, cleared Ethiopian customs and immigration at Tessenei and proceeded to cross the border. Everything went as planned except that upon reaching the guard station at the Sudan border all personnel were required to take a physical examination. This was given on the spot by Sudanese health officers and included generous spraying with DDT. The convoy then proceeded on to Kassala. Customs and immigration at Kassala were passed by midafternoon, and an official call was made on the Governor of Kassala Province. The Governor was very cooperative and furnished much information regarding roads and facilities in the vicinity of Khashm el Girba. He persuaded the party to remain at Kassala that evening, and quarters were provided at the Kassala rest house.

The following morning the convoy proceeded to Khashm el Girba, where the principal of the Government School and the Sudan railway depot master assisted the party and provided quarters at the rest house. The subordinate camp remained at the Khashm el Girba rest house all during the Sudan operations. These rest houses are especially built for visitors and usually consist of one or more large buildings with several rooms and generally a separate building with kitchen facilities. They are unfurnished, but this presents no problem to safaris having camping equipment and does provide a clean, cool, roof with caretakers, guards, etc.

Three Sudanese Survey Department steel builders were waiting for the subparty at Khashm el Girba. They had arrived as promised a few days earlier from Khartoum with trucks, two 103-foot steel towers and other building equipment, and they were ready to go to work on the erection of the two towers necessary to observe the stations selected by the Sudan reconnaissance. The two helicopters from Tessenei arrived at Khashm el Girba the next day and a reconnaissance of the selected stations was started immediately. All stations in the arc to the border were visited and the two tower sites were also found by helicopter.

The steel was delivered to the first station, and actual tower construction was started on the last day of October. Considerable difficulty was encountered in delivering the steel to the next station, located on the opposite side of the Atbara River from Khashm el Girba, where no truck tracks into the area were evident.

This entire region is covered with tall tropical grasses which frequently reach six to eight feet in height. Shortly after the end of the rainy season the grasses die and become a great fire hazard. By November each year fires rage back and forth depending on which way the wind is blowing. This hazard was a special threat to one of the triangulation towers found to be in a particularly vulnerable area. The Sudanese steel-truck drivers would not risk the safety of their trucks and the steel by going into unburned grass that could be quickly turned into a fiery furnace by a slight shift of the wind. Fortunately, an indirect route was located by helicopter reconnaissance through a burned-over area and the steel delivered. The steel builders were flown in by helicopter from Maqetta on the west side of the Atbara River, and both towers were completed during the first week of November.

The first observing schedule was accomplished on the night of 6 November by five "O" parties that had crossed the border to the Khashm el Girba subordinate camp on 3 November. Five stations were occupied on this first schedule. Thereafter, as quickly as a schedule was completed the "O" parties were moved ahead to new stations by helicopter. Towers at the two stations where this equipment was used were released and dismantled by 11 November. The Sudanese steel trucks and builders having completed their assistance to the expedition left for Khartoum via Kassala. By the middle of November all the triangula-

Observing crew at Triangulation Station 247 in the Sudan. B. D. Harrison, U. S. Observer, and Ato Aklilu Shaul, Ethiopian Recorder.

tion stations in Sudan had been occupied, and the last of the triangulation party returned through Kassala customs and immigration and recrossed the border to continue work in Eritrea and Ethiopia.

Meanwhile the leveling party, consisting of three observing units, cooks, drivers, and a mechanic, with eight vehicles loaded with instruments, tools, camping equipment, and food for at least two months, crossed the Sudan border on 1 November and arrived at Gedaref the next day. They immediately started recovery of the established first-order level bench marks along the Sudan railway in the vicinity of Gedaref, and after some difficulty checking the Sudanese elevations found three bench marks that checked within allowable limits. The party then continued leveling southeast toward Metemma. By 12 November they had completed levels to a point 35 kilometers southeast of Gedaref and on that date moved camp to the village of Doka. They moved camp one more time to Kuneima before crossing the border at Metemma on 29 November. Ninety-three miles of first-order levels were completed in Sudan in less than one month.

It was a great relief to the project as well as the Ethiopian Government to know that the operations in Sudan had been completed ahead of schedule, without incident, and as specified. This was particularly so because of the change in the Sudan Government on 17 November 1958, at which time the Sudanese military took over the Federal governmental functions. No effect was evident on the project operations; however, the party chiefs were in constant touch with the Kassala Province officials and alerted for any possibilities.

After recrossing the Eritrea-Sudan border south of Tessenei with the triangulation, the Tessenei party staked and measured an 11-kilometer first-order baseline and observed a Laplace azimuth station. Five old Eritrean triangulation stations were recovered in this vicinity and were tied into the scheme. On 25 November the party moved the base camp south to Om Ager and continued work southward to the line which was the limit of helicopter range out of Om Ager since it was impossible to move gasoline by truck south across the Takazze River. This line was reached and observed by 10 December and the following day the triangulation party packed up the Om Ager camp and started the 1100-kilometer trip via Asmara to Gondar.

Reconnaissance personnel moved with the helicopters across country to Gondar, utilizing gasoline previously cached at triangulation stations enroute. After reaching Gondar, reconnaissance and observing were started with the line GEDABI-DEBRA HARIA and continued southward along the border as far as helicopters could reach from the Uahni subordinate camp. The party worked eastward through Gondar and by the end of February had completed the project to the vicinity of Dessye.

Attention was redirected during the latter part of November to the level party with its unresolved supply problem of getting gasoline and food from Gondar to Metemma. The triangulation party was still in Om Ager. A relief convoy was organized utiliz-

Sudan Government Rest House at Khashm el Girba. Excellent quarters overlooking Atbara River.

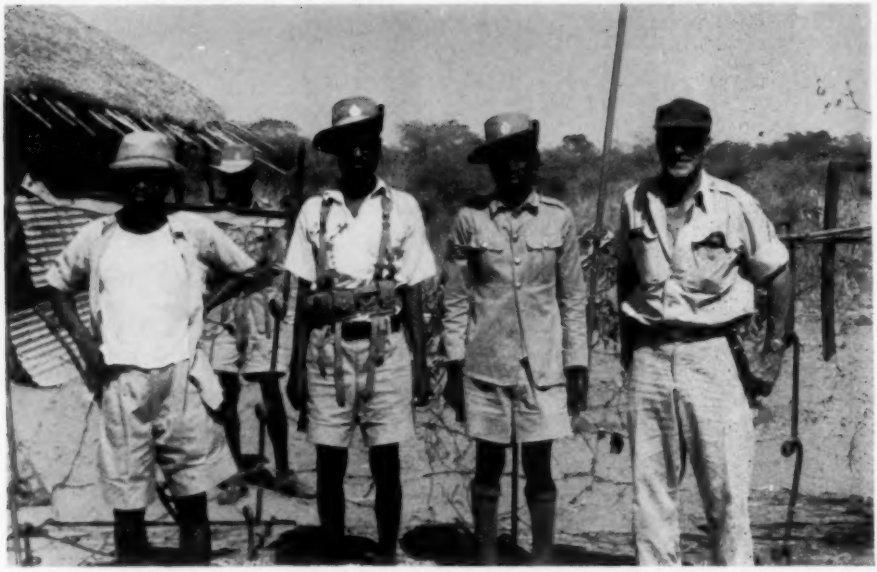
ing two triangulation trucks, a power wagon, and a Land Rover; the Chief of Project, assisted by Ethiopian mechanics and drivers started with the convoy for Gondar to attempt hauling supplics to the level party.

Between Asmara and Gondar one of the trucks broke a rear tandem axle, but fortunately by removing the broken axle and wheel and by chaining this tandem axle up to the truck frame, the mechanic was able to limp into Gondar. A replacement axle and housing were flown in from Addis Ababa, and the relief convoy got under way from Gondar with 20 drums each of truck and helicopter gasoline on 5 December.

The road west of Gondar was very good for the first 70 kilometers, but going down the mile drop at the escarpment near Chilga the path of the convoy became increasingly more difficult. Eventually a point about 65 air miles west of Gondar airport, but 2½ days' travel by truck, was reached, and the Uahni subordinate camp for helicopters was established at a burned-over, elevated spot. The helicopter gasoline was cached, and the convoy continued westward toward Metemma and the level party.

About noon the next day the convoy reached the level camp in an opening beside the trail among trees and tall grass. They had moved east about 40 kilometers from the vicinity of Metemma that morning and were down to one drum of gasoline, to say nothing of shortages of food, and other necessities. Needless to say, there was much rejoicing, especially since it was now known that they would have no particular difficulty with the road into Gondar. However, one of the relief convoy trucks had water-pump and fan-pulley trouble, but by using the Land Rover and backtracking with the one good water-pump assembly the convoy got back to Uahni and was rescued by the triangulation party.

The leveling party, despite illness and other extremely difficult conditions, completed the line into Gondar by 15 January and a the end of February was at a point east of Debra Tabor. The line has since been completed to Dessye and southward to close the small gap in the line to Addis Ababa. A small gap was also closed near Lechemti to extend the levels from Addis Ababa to Asosa.



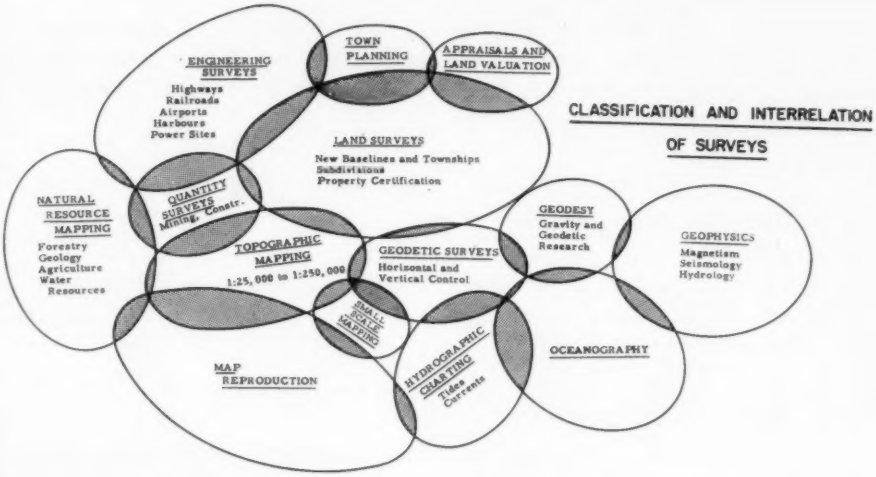
At Metemma, Ethiopia-Sudan border, January 1959, Ethiopian Governor of Metemma, Police Guard, and Commander D. A. Jones, USC&GS Chief of Ethiopian Geodetic Expedition.

With justifiable pride of accomplishment and satisfaction regarding the project, the parties were able to complete the connections to the Sudanese triangulation and leveling and bring the geodetic datum into the Blue Nile Basin. The connections provide a horizontal datum for the Basin mapping, based on the African datum as established by the 30th meridian arc through central Africa. Since the Blue Nile triangulation will provide a basis for future extension of horizontal control throughout Ethiopia, all future mapping in Ethiopia can be related to this common continental datum. The leveling connection carried elevations from Sudan that in turn had been carried from a sea-level datum at Alexandria, Egypt. This assures elevations related to mean sea level for all the Basin mapping and future Basin projects and will provide a sea-level datum for extension throughout the rest of Ethiopia.

No breakdown in the accuracy of the surveys being undertaken has occurred. Triangulation specifications for first-order control and baselines, azimuths, and astronomic stations are being met in fulfilling the requirements of the project. The leveling specifications call for regular first-order double-run lines, but where the ruggedness of terrain is too great the leveling may be single run. As yet no single run lines have been left; however, many times the level units could look down or up at the end of the day, after 200 setups in one direction, and see where they started that morning. The percentage of reruns has been discouraging at times.

The project is now "over the hump" and, with continued progress at the present rate, the actual field work will be completed in something over the two years originally estimated. Since field work could not be started until the end of 1957, the completion is expected sometime in 1960. This accomplishment must first be attributed to the efforts of the Ethiopian and U. S. technicians actually responsible for the program, and secondly to the governments involved for supplying funds, equipment, and facilities. At times, as a result of mistakes and confusion, the difficulties encountered by

attempting this type of operation in one of the most remote areas of the world have seemed insurmountable, but, in keeping with the spirit and enthusiasm of Coast and Geodetic Survey field engineers, "Where do we go next?"



THE INTERRELATION OF VARIOUS BRANCHES OF SURVEYING

Prepared and presented by the Education Committee of the Canadian Institute of Surveying at the Colloquium held in Ottawa, Canada, October 28–29, 1959.

New Swedish Map Plotting Device

The lack of a perfected plotting device has frequently resulted in a backlog of drafting at the Swedish Land Survey Office in Stockholm, which in turn has meant that large sums of money required as bank guarantees for building construction programs have been blocked. A completely new type of polar coordinatograph, designed by Svenska AB Gasaccumulator—the AGA Company in Stockholm—in cooperation with the Land Survey Office, which permits rapid and easy plotting, has largely solved this problem by increasing the efficiency of the draftsmen.

The new device is a high precision optical instrument especially developed for accurate map plotting, but it can also be used for other technical purposes, such as tool making and control measuring. Polar coordinates are plotted when extremely accurate detail is being carried out, in making maps for road construction and new housing developments, etc.

The angular scale of the AGA Polar Coordinatograph is divided into 400 degrees, but it is also available for 360 degrees. It can be set to zero in reference to an arbitrary datum line, thereby making it possible to read angles directly. By turning a knob, the draftsman can alter the field of vision in the eyepiece so that a small portion of the map and a circular centering mark can be seen in place of the scales. The centering mark facilitates centering when setting up the instrument.

The angular and linear coordinates are then set on the scales and the point is plotted directly on the mapping paper by pressing a button on the plotting stylus attachment. Its radial arm is connected to a coupling ring, centered directly over the pole. When the button is pressed, a plotting pin makes a hole in the mapping paper.

—Holger Lundbergh
American-Swedish News Exchange, Inc.

CIRCULAR AREA SEGMENT FORMULAS

The segment of the circle, or portions of the sector, occur frequently in modern subdivision computations.

Smoley's "Segmental Functions", has logarithmic, five place, tables, for convenient calculation of some segmental areas. For example, in case 6, hereon, see his table of $f=\frac{F}{R^2}$

Case 3 occurs when the area on a curve is required between a street center line and a property line.

Case 5 always occurs when the external area is to be deducted from a lot corner when rounded at an intersection.

The other cases occur in city lot computation, but less frequently.

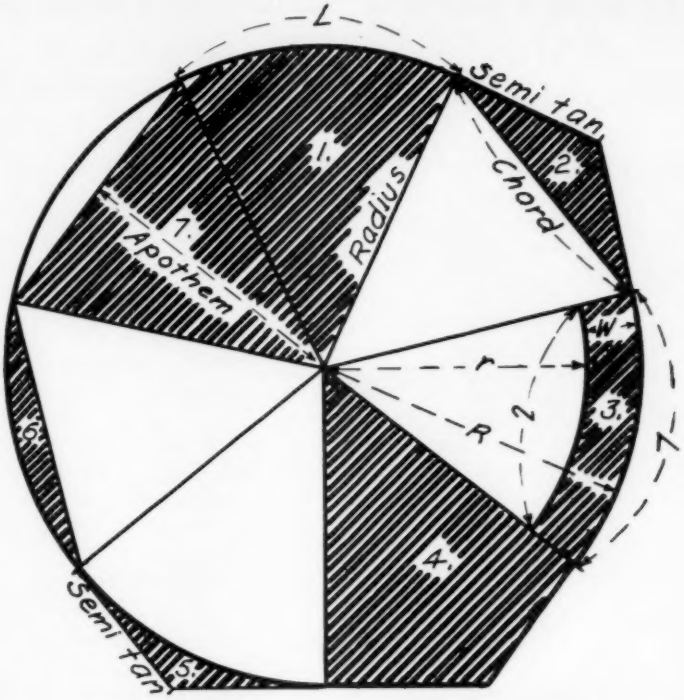
In applying these formulas note that Circular Arc, Radius 1, tables, found in many surveying texts are are actually radian values.

Note also, that the R^2 factor in segment formulas, originates in its relationship to the area of circle, which is:

$$\text{Area} = \tfrac{1}{2} \text{ circumference} \cdot R = \tfrac{1}{2} 2R\pi R = \tfrac{1}{2} 2\pi R^2 = \pi R^2$$

Part of these formulas, by Clinton C. Hubbell, C.E., will be found in the July – September, 1951, issue of SURVEYING and MAPPING, page 287.

By: Paul J. Dowling, L.S. 2668, Santa Rosa, California.



1. $\frac{1}{2}RL$. Or, $\frac{1}{2}R^2\theta$. The sector, – a basic figure.

2. Tan $\frac{\Delta}{2}\left(R \cdot \sin\frac{\Delta}{2}\right)^2$. Or, R • semi tan – ½ Apothem • Chord

3. $\frac{1}{2}\theta(R^2-r^2)$. Or, $\frac{1}{2}R \cdot L - \frac{1}{2}r \cdot l$. Or, $\frac{L+l}{2}W$. Or, $\frac{\theta}{2} \cdot (R+r)W$.

4. $R^2 \cdot \tan\frac{\Delta}{2}$. Or, R • semi tan.

5. $R^2\left(\tan\frac{\Delta}{2} - \frac{\theta}{2}\right)$. Or, R • semi tan – ½ RL.

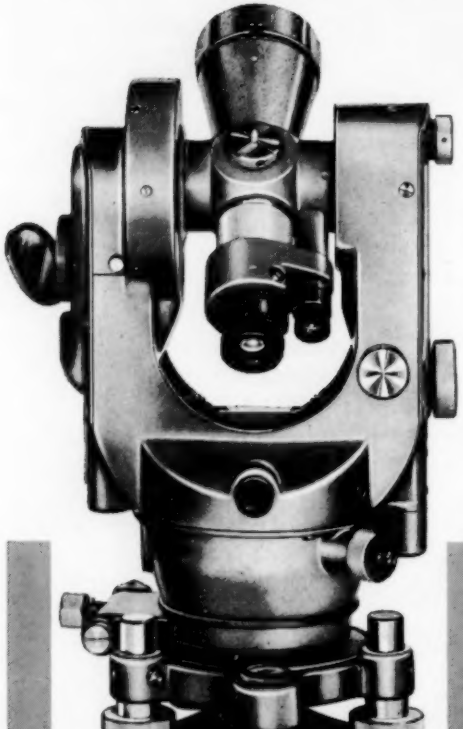
6. $\frac{1}{2}R^2(\theta - \sin\Delta)$. Or, ½ R • L – ½ Apothem • Chord.

7. $\frac{1}{2}R^2 \cdot \sin\Delta$. Or, ½ Apothem • Chord.

IN THE ABOVE: Δ is the central angle in degrees.
θ is the central angle in radians.

SURVEYORS SERVICE CO.

exclusive distributor in the nine western states for world-famous **WILD** *instruments*



A full range of Wild transits, such as the T-1A Optical Repeating Transit shown here, plus levels and theodolites, are always available from Surveyors Service Company, the West's outstanding source for all field supplies. In addition, you'll find complete stocks of stadia and leveling rods, range poles, tapes and specialty items.

Even more important, perhaps, is our completely equipped service department, where skilled technicians repair and calibrate Wild and other types of instruments.

WILD
HEERBRUGG

Exclusive Western Distributor: **WILD HEERBRUGG INSTRUMENTS, INC.**
Dealers in principal cities in the west

SURVEYORS SERVICE CO.
2021 South Grand Ave., Los Angeles 7, Calif. • RIchmond 7-0606

SERVCO

George A. Greenewald

Survey Control for the Feather River and Delta Diversion Projects

By TRACY L. ATHERTON

DEPARTMENT OF WATER RESOURCES, STATE OF CALIFORNIA

THE IMPORTANCE of water to the economy and growth of any State here in the west is self-evident. In California, however, its importance is magnified many times by a population growth which is almost unprecedented. Right now, California's population is over 15 million—more than double what it was twenty years ago—and it is estimated that the population will be 56 million by 2020—nearly four times the present total. All of these people have to drink, wash their clothes, take baths, and water their gardens. The expanding industries which employ them must be supplied with water, as must the agricultural lands which provide their food. When they are not working, they need a place to swim or fish or operate a boat.

California's water problem is now and always has been one of maldistribution of resources in relation to human needs for water. Geographically, the major sources of water are in the northern one-third of the State where much of the runoff now wastes into the ocean virtually unused, while most of the agriculturally productive land and the major urban areas are located in the central and southern regions where water resources are insufficient. Interposed between the major sources of water and the principal areas of deficiency are great distances and formidable ranges of mountains.

From an engineering standpoint, these physical difficulties can be overcome by constructing dams and reservoirs to conserve winter and wet year flows and by constructing aqueducts, pumping plants, and distribution systems to convey the water and to make it available for use when and where it is needed. The California Water Plan, published in 1957, provides a general, long-range guide for accomplishing this massive alteration of nature's scheme of things.

The Legislature approved The California Water Plan, not as an engineering solution for all time, but as a general guide for long-range, water-resource development by all agencies—Federal, local, and State—and a flexible framework into which to fit individual projects.

Certain large components of the plan are required immediately and the Legislature has assigned the design and construction of these features to the Department of Water Resources.

Briefly, the first major developments to be undertaken by the State are described below. These immediate projects, the Feather River and Delta Diversion Projects, will involve one of the greatest mass movements of water ever conceived or attempted. Authorized by the Legislature in 1951 for State construction, the projects will provide the means whereby some of northern California's abundant surplus of water may be delivered to the deficiency areas of the State, as far south as San Diego County, some 750 miles distant. Proceeding from north to south, the first major feature is a large dam and reservoir on the Feather River near the City of Oroville. The Feather River is the largest remaining uncontrolled tributary of the Sacramento River. This multiple-purpose reservoir will provide flood control, store water for subsequent release to lands in the Sacramento Valley, and will serve as a source of supply to the Sacramento-San Joaquin Delta, where the water will be pooled with that available from other sources for export to the west and south.

A large aqueduct system will divert water from the Delta and transport it along the west side of the San Joaquin Valley to a large, off-stream, storage reservoir near the

Presented at the Western Regional Conference of the American Congress on Surveying and Mapping at Los Angeles, California, October 29, 1959.

City of Los Banos. More aqueducts will take the water on to the southern end of the valley, where it will be pumped over the Tehachapi Mountains into southern California, including the Antelope Valley-Mojave River Area and the Whitewater-Coachella Area. Branch aqueducts will serve the area south of San Francisco Bay in Alameda, Santa Clara, San Benito, Santa Cruz, and Monterey Counties, and San Luis Obispo and Santa Barbara Counties. The North Bay Aqueduct will also divert from the Delta and will serve the area immediately north of San Francisco Bay. Other features include works for water supply, flood control, and salinity control in the

Delta, and five smaller projects for irrigation and recreational purposes in the Upper Feather River Basin above Oroville.

It is apparent from the foregoing that the surveying work extends over a considerable geographic area. Surveying must necessarily be conducted simultaneously at numerous areas in order to provide, within a reasonable period of time, the maps required by the design sections. To complete this large volume of work and meet assigned deadlines much of our surveying is accomplished for us by photogrammetric mapping contractors.

Under these circumstances it is fortunate that there is available throughout California, especially in the areas of immediate interest, a good distribution of U. S. Coast and Geodetic Survey triangulation stations. This enabled the Department to place its surveys for the Feather River Development on the California Coordinate System and utilize the Coast Survey's easily identifiable and well established marks to reference the detail surveys.

Through the California Coordinate System there was obtained a definite and universally applicable basis of bearing which by mathematical definition results in only one bearing for identical lines on all surveys. The System also permitted abandonment of the converging meridians as a basis of reference and the substitution therefor of a rectangular grid. Azimuths are carried from the control into the work and out of the work back to the control for check. Intermediate checks are made through solar or astronomic observations and utilizing the mathematical relationship readily available in tabulations.

Through the Califorina Coordinate System there is obtained an over-all and accurate check of lengths and positions throughout a survey. Further, a survey made in the usual manner, but lying between and tied to control stations, is susceptible to proportional correction of measured lengths.

The System inherently provides an excellent means of indexing maps, field notes, property descriptions, and any other matter basically related to geographic position; only one pair of California coordinates will fit a designated point on the earth's surface. The System is universally applicable throughout the State and its basic values are defined in the California Statutes. The coordinates are indexed on the margin of each U. S. Geological Survey quadrangle map.

California coordinates permit a ready comparison of overlapping or junction surveys even though each is conducted without knowledge of previous work in the area. There are no equations of bearings, no lost tie points or costly connection surveys involved.

At the present time plans of the new San Joaquin Valley-Westside Freeway are being prepared by the Division of Highways on the Coordinate System. Accordingly plans for the freeway can be compared without difficulty with the San Joaquin Valley–Southern California Aqueduct plans. Because these two projects elbow each other in the limited space available above the Delta-Mendota Canal, the plans require frequent comparisons and personnel of the Department have learned to fully appreciate this advantage of the System. The Division of Highways, incidentally, is farther advanced with its field surveys in this area. This will save the Department considerable surveying as our men can use Highway's section-corner coordinates for ties for our acquisition surveys.

The California Coordinate System materially speeds up the work in the early, and usually rushed, planning stages for canals, highways, power lines, pipe lines, etc., by providing in advance the rerun or check survey required on route surveys. The System also allows the surveys to be made in convenient sections, and these sections can be worked in any order that the office planning may require or field conditions will permit, with the knowledge that all parts will fit together without equations. Uniform statewide vertical control is available through the medium of the U. S. Coast and Geodetic Survey level net.

If construction is delayed until ten or fifteen years after the planning stage, no resurvey is required to replace lost survey stakes. The plans can be staked on the

ground without recovery of a preliminary line.

All of the surveys for the Feather River and Delta Diversion Projects have been conducted on the California Coordinate System. As survey after survey, all on the same System, is added to the working drawings, real appreciation of the system comes home to the many users of the maps. However, as many readers will realize, there were times when the extension of control from Coast Survey stations to the area of the work constituted a sizeable task in itself. But more of that after a brief explanation of the route location methods employed. These have experienced a transition from the classic textbook examples.

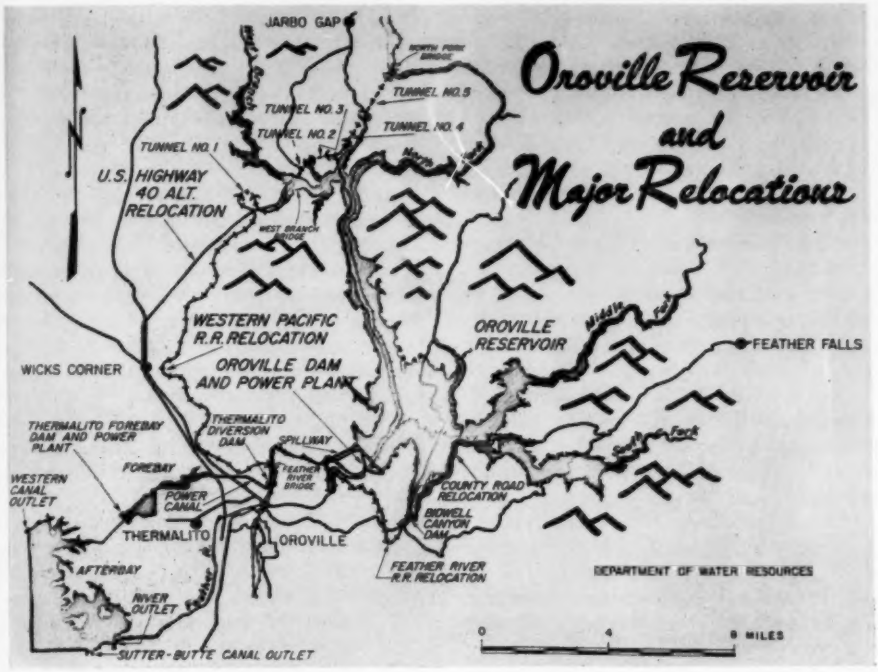
Practically all initial planning is accomplished on U. S. Geological Survey quadrangle sheets. The State of California has been, since 1904, a cooperator with the Survey and in 1945 materially stepped up its contribution to the cooperative topographic mapping program. Since 1946 the cooperative program of the Geological Survey and the State, and additional Federal contributions, have accomplished an average of $750,000 worth of topographic mapping each year. Within a few years quadrangle sheets, at a scale of 1:62,500 or 1:24,000, will be available for the whole of California.

In the initial engineering phase of a route study, the suggested line is carefully fitted to the topography of Geological Survey quadrangles. However, instead of following this step with the usual centerline and cross-section surveys, there is obtained photogrammetric contour coverage plotted relative to grid lines of the appropriate zone of the California Coordinate System. This coverage will vary in scale from 1″ = 100′ to 1″ = 400′; and in contour interval from 2½′ to 20′ depending on the terrain and anticipated type of conduit. Often several alternate routes are surveyed in this manner, or in mountainous terrain large blocks will be contoured so that detailed comparison of costs along various routes can be computed.

That romantic symbol of heavy engineering, the location engineer, in his stiff-brimmed Stetson and high leather boots, who, aided by his trusty transit, so unerringly "eyeballed" the final line on the spot, has disappeared. In his stead we have a team composed of the topographic engineer, the engineering geologist, and the hydraulic engineer. The topographic engineer supplies the contour mapping; the geologist adds the geologic field mapping and core drill data; and the hydraulic engineer, sometimes utilizing a digital computer for the purpose, integrates these data with pumping costs, excavation costs, and canal, pipe, and tunnel costs.

The resulting final alignment and hydraulic grade line will be such that the engineer can be assured that each has been established as well as the cost and construction data will allow. This method results in the proper proportionment of the pumping lifts, power drops, and the lengths of tunnel, canal, and pipe line so that over-all economy in the line is achieved. The determination of the aqueduct location, for all except the most simple terrain, is arrived at in the office.

The coordinates of the P.I.s of the selected alignment are read off the plan together with the selected curve radii. From this information, a small digital computer then supplies the azimuths of the tangents and all of the curve data and stationing information required. Centerline profile data are developed by inspection of the plan. This line is staked upon the ground beginning at a convenient control station and tied out to a second control station within one to three miles. Field cross-sections are taken at this time. Variations of one foot vertically between the interpolated elevations for the centerline stations and the elevations read in the field are about the maximum that have been observed. Only when these variations run consistently with the same sign do we experience difficulty. Field revision of the alignment to correct the match to the terrain is infrequent, and, to date, the maximum required has been a lateral correction of forty feet. This speaks very well for the work of the many photogrammetric mapping contractors who have supplied the Department with mapping of hundreds of square miles of California.



The "convenient control stations," which anchor the final line, are new control stations established at intervals of one to two miles along the route surveys. These stations are positioned with relation to first- and second-order Coast and Geodetic Survey triangulation stations to second-order (Class II) closures.

These stations are set for the "control" of the ground surveys and, to serve the purpose intended, they must be more accurate than the surveys dependent upon them. The Department's dependent surveys are run with double-center instruments, conventional tapes, spring balances, and plumb bobs. Experience has demonstrated that it takes an exceptional crew to consistently approach one part in 10,000 agreement on transit surveys over average or difficult terrain against control lengths established by alternate methods to a higher order of accuracy.

Before the advent of the electronic distance measuring devices our subordinate control was established by triangulation. As can be seen from the general map of the Oroville features of the Feather River Project, control was required along several routes in widely dispersed sections of this rough, brushy, and timbered area.

The relocation of the Western Pacific Railroad ascends along the west edge of Table Mountain to a brief junction with the highway relocation at the West Branch bridge, then progresses through a series of tunnels to the point at which it joins the original alignment in the Feather River Canyon. In 1952 it was planned that the relocation of Highway 40 Alternate should proceed directly north from Oroville over Table Mountain, join with the Western Pacific on a combination bridge over the West Branch, then proceed north through Yankee Hill to rejoin the present U.S. Highway 40 Alternate near Jarbo Gap. It was also a requirement to relocate a section of the Feather River Railway which follows the South Fork of the Feather River to a

mill at Feather Falls. This latter relocation must necessarily come out of the Feather River Canyon downstream from the proposed dam and wind its way along the south bank of the new reservoir. Several county roads in the vicinity of the Middle Fork are scheduled for relocation and, of course, control stations are required in the vicinity of the dam site.

Within this extensive area of 360 square miles there are available six first- or second-order Coast and Geodetic Survey stations which are a part of the Sacramento Valley net. The placement of practically all of the first auxiliary stations was dictated by the requirement to shorten the length of the triangulation lines. This paved the way for satisfactory figures for the positioning of the control stations along the various alignments.

All of the observations were made at night on small lights 1½″ inches diameter. Five sets of direction readings on one-second theodolites were turned for agreement within a spread of five seconds. Stations were reoccupied when a triangle closure exceeded six seconds. Triangle closures were within the three-second average required for second-order work.

No attempt was made to adjust the net as a unit. A simultaneous adjustment of selected principal stations was first computed and, from that point forward, segments of the triangulation were rigidly adjusted with relation to the bracketing, previously adjusted stations.

One weak point in the triangulation scheme arose through the fact that observers were unable to occupy Bloomer Hill because of high timber and lack of an observation tower. However, a 110-volt eccentric light was placed on the Forest Service lookout tower at this point. This light was observed from a number of stations and afforded a supplemental check on the accuracy of the triangulation. From these tests it was apparent that, even with an unoccupied main station, we had attained an accuracy of one part in 10,000.

The Western Pacific Railroad relocation has been staked from the subordinate triangulation control with good agreement, and the relocation of Highway 40 Alternate utilized a large number of points established in the net. The triangulation net also has served the land-acquisition surveys. Refinements and additional stations will be required in the vicinity of the dam before construction starts.

In the spring of 1959, several of the lines of the net were tested with a Tellurometer. The lengths of two seven-mile triangulated lines were checked by Tellurometer measurement within two-tenths of a foot. Another seven-mile measurement by Tellurometer across two triangulation figures agreed with the coordinate distance to one part in 50,000.

Two additional nets of similar design and accuracy, but slightly smaller in extent, were observed along the north edge and the south edge of the Livermore Valley. These established subordinate control stations to second-order accuracy at spacings of approximately one mile along canal alignments. In these latter two schemes the triangulation was utilized for photocontrol, for land-acquisition surveys, and for alignment staking.

It is inherent in the method that triangulation control for route surveys involves the positioning of over twice the number of stations required for immediate control of the narrow strip under inspection. From the first announcement of the electronic, distance-measuring devices, it was realized that here was a method which could provide control of route surveys in a more economical manner. It also would provide the means of accurately establishing stations in narrow canyons, and this is almost an impossible task with triangulation methods.

Since the first of 1959, the Department has had a Tellurometer system in daily use. Among other uses it has been employed extensively for the establishment of control along the San Joaquin Valley–Southern California Aqueduct and the branching aqueducts. The establishment of basic control stations by Tellurometer traverse progresses easily at the rate of four to seven stations per working day and experience has demonstrated that accuracy of lengths to one part in 25,000 can be anticipated

in all cases. However, in the vicinity of Avenal Gap the rolling, bare hills proved unsuitable for Tellurometer measurements. These lines will be worked with a small geodimeter with similar accuracy. The golden age of supplemental control has certainly arrived—the paramount question is not that of accuracy of instruments and methods but whether or not the boys prefer to work on the day shift or the swing shift.

These electronic, distance-measuring devices offer an opportunity for the expansion of second-order control at an extraordinary rate. With one Tellurometer system the Department of Water Resources has measured more than 1,000 lines since January first of this year (1959), and each line was measured to an accuracy of one part in 25,000. The California Coordinate System is based on only 8,000 first- and second-order Coast Survey stations. It takes practically no imagination to visualize the impending rapid expansion of control for the system.

Even though the horizontal control is very important in the survey work of the Department, the vertical control is of more concern. The necessity to adjust laterally an alginment a few feet would, in most instances, cause little difficulty; however, an elevation error of one foot in the canal reaches of the project would present a very serious and costly problem. The hydraulic gradient in the principal canal of the San Joaquin Valley–Southern California Aqueduct will be less than three inches per mile.

The Department's leveling depends basically upon the very extensive network of level lines established throughout the State by the U. S. Coast and Geodetic Survey. We utilize this network exclusively throughcut the project (statewide) to establish our level datum.

The Department of Water Resources control leveling has been conducted with U.S.G.S. type precise rods, graduated in yards and hundredths, the three-wire Zeiss Opton level, and metal turning points. Runs start on Coast and Geodetic Survey bench marks and close on similar benches, preferably on another level line. Second order closure is specified, 0.035 foot times the square root of the length of the line in miles. A four- or five-man party can average eight miles of leveling per day. Whenever practical our level lines will cover an extensive reach, sometimes one hundred miles, and within such a distance will pass over marks established on several Coast Survey lines.

Experience has demonstrated that the three-wire method of leveling is a fast method almost entirely free of the usual errors. It permits the engineer to analyze checkout differences without arbitrarily assigning them to the leveling operation. Using this method in the 1953 leveling work on the west side of the San Joaquin Valley, several extensive reaches where land subsidence had occurred were identified.

This discovery contributed materially to the inauguration of a very extensive study of subsidence. Remapping by the U. S. Geological Survey determined that in the Los Banos–Kettleman City area a maximum subsidence of over 18 feet had occurred. Near Panoche an area of over 50 square miles had subsided more than 10 feet vertically. Periodic releveling by the Coast Survey revealed that subsidence was occurring in some areas at the rate of one foot per year, and that subsidence could be expected along any portion of the canal route between Los Banos and Kettleman City. A very thorough study of the situation has been conducted under the auspices of the Inter-agency Committee on Land Subsidence in the San Joaquin Valley, and various papers have been written on this work.

In addition to the comprehensive network leveling conducted by the Coast Survey at the request of the Inter-agency Committee, both the Division of Highways, in connection with its West Side Freeway, and the Department of Water Resources, in connection with the San Joaquin Valley–Southern California canal, have established bench mark runs which will be periodically releveled to determine the rate and extent of further subsidence along the respective routes.

While engaged in checking photogrammetric mapping at Wheeler Ridge in the

Spring of 1953, a Department level party ran a cross connection of four miles between two level lines of the Coast Survey. The leveling between these lines was in disagreement by approximately 2¼ feet. A backrun showed that no error had been made. This area was thirty miles from Tehachapi but it was apparent that the considerable vertical movement had occurred on the White Wolf Fault in connection with the Tehachapi earthquake. The area included in the movement was later extensively delineated by Coast Survey leveling along Highway 99 and in the vicinity of Arvin.

As a result of these leveling experiences we have learned to place trust in the three-wire leveling method and to program level runs for extensive reaches. It is also apparent that the face of this old world develops wrinkles at a much more rapid rate than we previously thought possible.

In one of the advance announcements for this meeting, this paper was listed under the title, "Precise Control." To accurately apply this title to the Department of Water Resources survey operations, the author feels it should be divided into (1) Control Surveys, and (2) Precise Surveys. The following will deal with the Department's current work in precise measurements.

The damage suffered by railway tunnels in the Tehachapi earthquake sharply focused the attention of the Department on the fact that more than half of the water to be delivered by the Feather River and Delta Diversion Projects must be transported across the San Andreas Fault. The U. S. Coast and Geodetic Survey had demonstrated, by comparison of repeated triangulation observations, that right lateral movement along the fault averages approximately 2 inches per year. The advent of the Model II Geodimeter presented the possibility that measurements along the fault could be made to such precision that distortions of the earth's crust along a particular section might be measured as they occur.

During the past summer the lengths of 16 test lines, each approximately 20 miles long, have been measured with the Department's Geodimeter II. Each line crosses the San Andreas Fault at an angle of approximately 30°. These test lines are spaced along the Fault between Gorman and San Jose. Remeasurement of the lines in later years will provide data on the accumulation (or release) of strain along the fault.

At the present, the Department of Water Resources is cooperating with the U. S. Coast and Geodetic Survey in a triangulation survey of the area bounded roughly by lines joining Mojave, Lake Elizabeth, Mt. Frasier, Maricopa, Bakersfield, and Tehachapi. This initial survey will include the area in the vicinity of Gorman where, because of topographic conditions, will be located the principal conduit to southern California. Approximately ten per cent of the lines in the scheme will be measured with the Department's first order Geodimeter.

Angle observations will be made by the Coast Survey and will conform to specifications (modified) for First-Order, Class I triangulation. The angle observations at each station will be made on two different nights. Average triangle closure is not to exceed 0.8 second, maximum closure is seldom to exceed 2.5 seconds. It is expected that the procedure outlined will limit the maximum length error of any line in the scheme to 1 in 200,000.

Reobservation of the net in later years and in the same manner will provide comparisons of lengths and angles by which the geologists and seismologists will be able to outline principal areas in which the hydraulic engineer will need to take special precautions in the design of the aqueduct.

In summation; the area over which surveys are conducted for the Feather River and Delta Diversion Projects is very extensive, and the surveying for the projects is greatly facilitated by utilizing the California Coordinate System. No preliminary lines are staked, but the detailed route locations are accomplished on small and large scale topographic maps, and the selected lines are staked upon the ground through extension by the Department of second-order horizontal and vertical control from monuments of the U. S. Coast and Geodetic Survey. Precise surveys are also conducted along the San Andreas Fault.

Notes on the Impossible

By ERWIN SCHMID

COAST AND GEODETIC SURVEY

THE TRISECTION of an arbitrary angle by graphical means is a legitimate mathematical problem, but its solution is of dubious practical value since the same result can be obtained, to any required degree of accuracy, by dividing the corresponding circular arc with a pair of dividers, i.e., a compass. There must be scores of such solutions, dating back to antiquity, and I would not venture to say whether the one presented here is original or how it compares with others in ingenuity, simplicity, etc.

One thing is certain, though, the author is one of the "Don Quixotes" referred to by R. C. Yates in "The Trisection Problem." He is aware of the fact that the impossibility of construction in a *finite* number of steps, using only ruler and compass, has been proved, but nothing will even convince him of this fact. "The impossible takes a little time."

The claim made in the title is, of course, unsubstantiated, and the fallacy of his argument is pretty obvious. He doesn't understand what is meant by an *exact* construction in the mathematical sense. An exact construction is an abstraction of the mind and cannot be realized with drawing instruments or any other material tools. For example, it is just as impossible to *define* a point (in the mathematical sense) by a dot made with a pencil as it is to draw a "circle" with a compass. No matter how carefully these may be drawn, sufficient magnification will show *finite* deviations from the ideal. Even though the bisection of a line is theoretically possible with ruler and compass, no one has ever achieved this "exactly," or ever will, on a drawing board. With "perfect" instruments it could be done whereas trisecting an angle could not. Taking into account the inevitable material limitations of the drawing instruments, however, the two problems are practically equivalent insofar as "possibility" of construction is concerned. No matter how high the degree of exactness required of a drawing may be, there is, and must be, an allowable error which, no matter how small it may be prescribed, is nevertheless finite. A converging process of construction, such as the author describes, will eventually, and after a finite number of steps, satisfy this standard of accuracy, i.e., the error in the construction will be of the same order as the inevitable error in his instruments, but beyond this one cannot go. For all practical purposes the construction is exact, but theoretically, of course, there is still an error. With theoretically "perfect" drawing equipment, the instrument error is zero and one could continue with this converging process indefinitely, but the error in the successive approximations, while continually decreasing, would *never* actually become zero. Thus, while the limit is zero, it cannot ever be reached, and this is a matter of definition which must be accepted if one wishes to understand the theory of infinite processes.

The author's attempt to sidestep this inevitable conclusion by resorting to Desargues's Theorem is no more successful. It is obvious from his figure 4 that the points *G*, *H*, and *I* lie on a curve so that *I* cannot be determined by drawing a straight line through *G* and *H*. The approximation may be as close as desired, but "close" does not answer the problem.

EDITOR'S NOTE: Quite some time ago, the Chairman of the Publications Committee, ACSM, received a manuscript concerning the trisection of an angle by graphical means. The paper was not considered a proper one for inclusion in SURVEYING AND MAPPING and was returned. However, during the consideration of the paper by several individuals, Mr. Schmid was prompted to write and submit for publication a brief philosophical discourse on this ancient problem. We have published this in the fond hope that, as far as this Journal is concerned, at least, it may serve to put a "road block" in the path of any future submissions of this type.

I dare say the author has heard all these arguments before and that nothing anyone can say will ever convince him. People who devote themselves to impossible problems have a mental blind spot on the subject and are, with respect to it, completely irrational. It is barely possible that if he read Yates' book he might recognize himself and devote his talents to something more realistic.

* * *

Canadian Institute of Surveying Holds Colloquium on Survey Education

The Education Committtee of the Canadian Institute of Surveying, under the chairmanship of S. G. Gamble, Director, Surveys and Mapping Branch, Department of Mines and Technical Surveys, sponsored a highly successful two-day conference on present and future problems in education for the survey profession. The conference, designated as a colloquium, was held in Ottawa, Ontario, on October 28 and 29, 1959.

Delegates were invited from each of the universities in Canada offering courses in surveying, from each of the provincial land surveyors associations, and from the various branches of government service employing surveyors. Special guests included: Prof. E. H. Thompson, Dean, Faculty of Engineering, University College, London, England; Prof. F. J. Doyle, Assistant Professor of Photogrammetry, Ohio State University; Prof. A. J. McNair, Professor and Head of Surveying Department, Cornell University; L. A. Dickerson of the firm of Sargent, Webster, Crenshaw & Folley, Watertown, N. Y.; and A. Phillips Bill, Chairman, Property Surveys Division, American Congress on Surveying and Mapping.

The meetings on the 28th were opened by an Address of Welcome by Armand Dumas, M.P., Q.L.S., President of the Canadian Institute of Surveying and the Quebec Corporation of Land Surveyors. Objectives of the conference were then outlined by Mr. Gamble. Following this, A. C. Hamilton Chairman of the Editorial Committee of CIS, presented a statistical analysis of the numbers of surveyors presently in practice and in government service and an interesting prediction as to future requirements. Abstracts of papers describing present and future needs for surveyors, presented by representatives of the various provincial associations, industry, and government service, completed the morning program.

Thursday afternoon was devoted to a discussion of papers describing survey education at present available in Europe, England, the United States, and Canada. The paper on "Survey Education in the United States" was given by Professor McNair.

Thursday evening, conferees were entertained at the Royal Ottawa Golf Club with a cocktail party arranged by D. H. Peden, President of Wild of Canada, and a sumptuous banquet provided by the Institute.

The Friday morning session was highlighted by an inspiring paper entitled "The Crisis in Survey Education," delivered by L. E. Howlett, Chief, National Research Council. The remainder of the morning was devoted to a panel discussion, chaired by Professor Thompson, presenting views of the various universites on problems presented by previous papers.

Friday afternoon, delegates toured the Photogrammetric Section of the National Research Council. The meetings closed with a summarization of facts and conclusions, presented panel-wise, with Mr. Hamilton serving as Chairman of the panel. Although no firm conclusions were reached, the Colloquium clearly recognized two major crises in survey education: first, the need for improved educational facilities for those aspiring to the land surveys phases of the profession; and, second, the need for a graduate school with a carefully planned curriculum for the training of a small number of much needed surveying scientists.

The meetings, as is customary with our Canadian friends, were extremely well planned, well organized, and well conducted. A noteworthy achievement of the Committee was the mailing of copies of most of the papers to the delegates a week or more before the meetings.

Complete versions of all papers and a condensed transcript of all discussions will be published in the January issue of the *Canadian Surveyor.*

—A. Phillips Bill, *Chairman,*
Property Surveys Division, ACSM

Surveying Equipment under Development for the Army

By LEONARD W. ANDRUKONIS

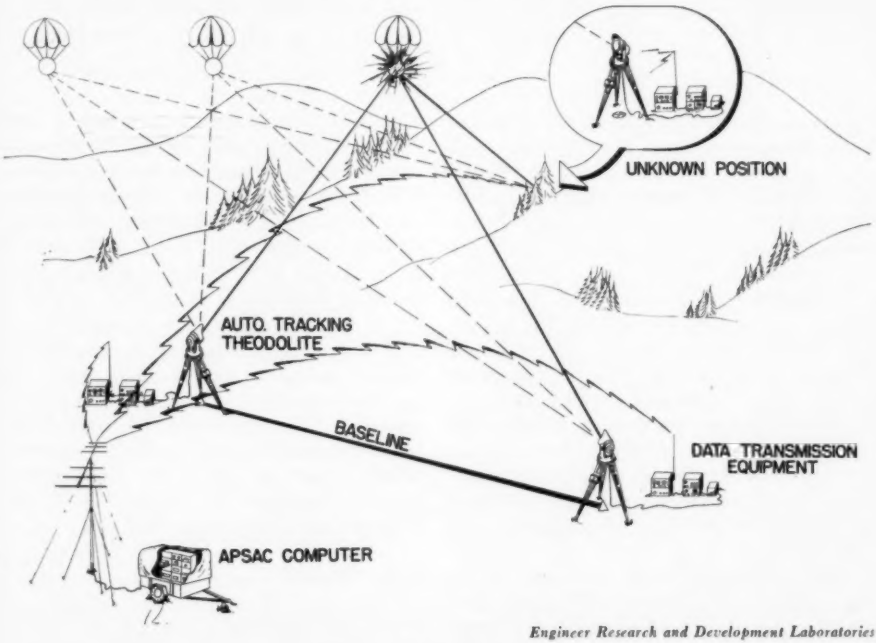
U. S. ARMY ENGINEER RESEARCH AND DEVELOPMENT LABORATORIES

FOR MY PART in this panel discussion I have selected several items of equipment now being developed under the sponsorship of the Corps of Engineers. I hope they will be of as much interest to you as they are to the people working on these projects. To begin with, let me say that I am not an expert on any of these equipments but rather one who is working closely with all the people directly concerned.

The *Automatic Tracking Theodolite* is the first item I will discuss. Figure 1 shows the general principle of operation.

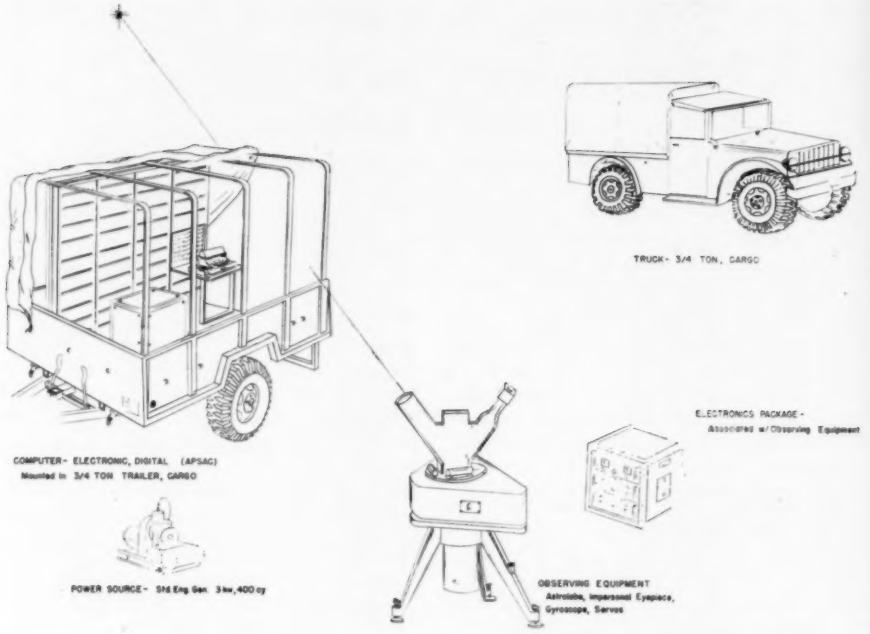
A minimum of three Automatic Tracking Theodolites will be required for conducting a survey operation. Two will be located at the ends of an established baseline and all others will be located at points whose positions are to be determined. A central computer station will be connected to all theodolite stations by a radio data-transmission link. All theodolites will simultaneously sight on the elevated target on command; the azimuth and elevation data thus obtained will be automatically trans-

Presented at the 19th Annual Meeting of the American Congress on Surveying and Mapping, Washington, D. C., March 11–13, 1959.



Engineer Research and Development Laboratories

FIGURE 1


TRUCK- 3/4 TON, CARGO
COMPUTER- ELECTRONIC, DIGITAL (APSAC)
Mounted in 3/4 TON TRAILER, CARGO
ELECTRONICS PACKAGE -
Associated w/ Observing Equipment
POWER SOURCE- Std Eng. Gen. 3 kw, 400 cy
OBSERVING EQUIPMENT
Astrolabe, Impersonal Eyepiece,
Gyroscope, Servos

Engineer Research and Development Laboratories

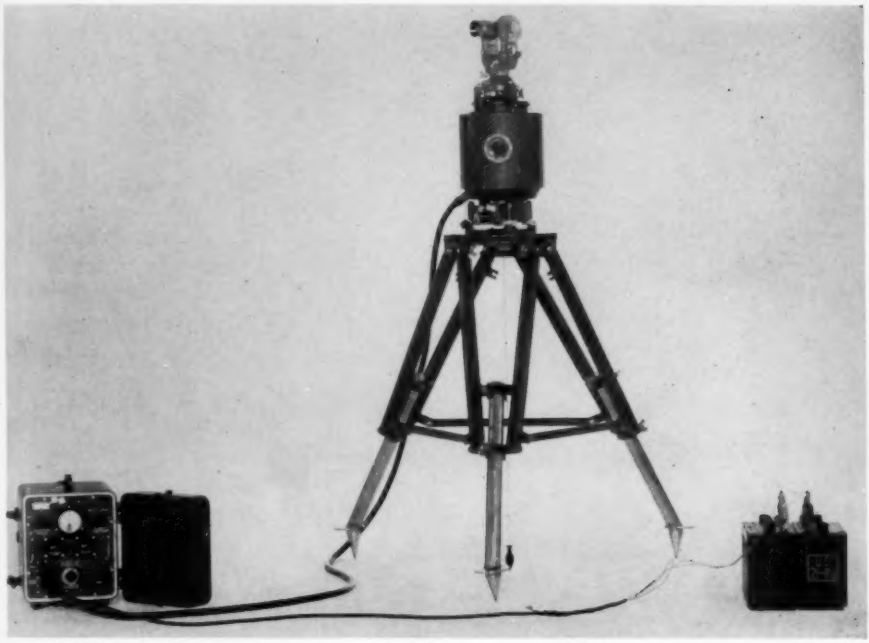
FIGURE 2

ferred from the individual theodolites to the central computer. The computer will then determine the position of the target and store the information for future reference. The computer will determine the location of each unknown position by solving the resection problem.

Preliminary pointings of each theodolite will be accomplished manually by the station observer with a simple "servo" aided control. After he has brought the target image into the field of view he will cause the theodolite to automatically hold the image in the center of the field as long as desired. The theodolites will be capable of pointing on stationary targets and of automatically tracking fast moving airborne lights.

The rated accuracy of this instrument is expected to be 20 seconds. At this time that rating seems conservative and it is hoped that eventually this instrument will furnish geodetic accuracy.

Another item of interest and perhaps one we can display at this Congress when available is the *Automatic Position Survey Equipment.* (Figure 2) This equipment will automatically determine astronomic positions by detecting star positions at a given instant in time and computing the unknown ground position. The equipment includes a 60° pendulum astrolabe modified with: (1) an impersonal eyepiece to detect star transits with high precision, (2) an automatic leveling system; (3) a pendulum gimbaled gyroscope to sense north as an azimuth reference; (4) a shaft angle encoding system to determine the numerical azimuth value for orientation of the telescope and; (5) associated servo drive systems to automate the sequence of operations. A companion equipment, an electronic crystal controlled clock keyed to WWV time standard, provides time to 0.001 second upon interrogation. The observing and computation operations are controlled



Engineer Research and Development Laboratories

FIGURE 3

and accomplished by an electronic digital computer programmed with the necessary catalogues of star data, trigonometric functions, and sequential observing procedures. Output data will be permanently recorded. The computer equipment will be mounted in a ¾-ton trailer; the observing equipment and associated components will be transported in a ¾-ton cargo truck.

The equipment will be used for evaluating principles to be incorporated in a subsequent final design for rapidly establishing astronomic positions in areas where no suitable survey control exists.

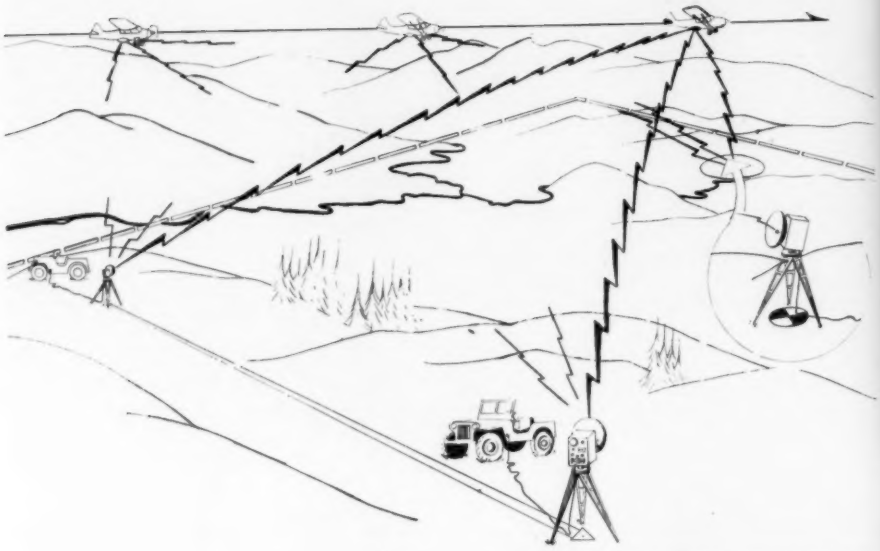
It is expected that the accuracy of results will be second order. Under average conditions the astronomic position determinations should be accurate to ±10 meters. These could differ from the geodetic positions by 100 to 2000 meters due to deflection of the vertical.

Figure 3 shows the *Gyro-Orienter*. A precise gyro is connected electronically to a nullmeter which indicates the relationship of the input axis of the gyro to the true east-west direction. Manual rotation of the gyro housing by the amount and in the direction indicated by the meter together with manipulation of electronic gyro controls permit the correct alignment of the gyro input axis in the east-west direction.

A Wild T-2 Theodolite is integrally mounted upon the gyro housing. The horizontal circle of this instrument is fixed with respect to the gyro so that horizontal directions to objects viewed through the theodolite are referenced to true north.

The Orienter will be used for making low-order traverses and for furnishing azimuth to Army units as needed according to its capability. This equipment can be used day or night under all weather conditions. Information relating to the accuracy of the Orienter is classified.

Figure 4 shows the last item I will present. Basically it shows the trend toward



Engineer Research and Development Laboratories

FIGURE 4

airborne instrumentation. It is anticipated that several of our ground operated instruments will be adaptable for airborne use. Present plans include testing of an airborne Tellurometer expected to be delivered this year [1959] in August. Its maximum operating range is anticipated to be about 150 miles. It will be suitable for use in light, Army-type aircraft. Its accuracy is anticipated to be ± 1 meter ± 1 part in 100,000 of the distance. Other details on this development are not available at this time.

Lake Survey Charts for Small-Boat Operators

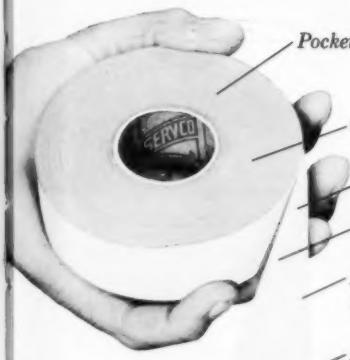
The U. S. Lake Survey has recently completed a second set of large-scale, reduced-size charts designed especially for the small-boat operator. This new set is designated as Chart No. 660, Inland Route, Michigan, and may be described as being a loose-leaf-style volume of 12 sheets, including an index. Small-boat operators who have been plagued for years in their attempts to navigate with the large-sized charts in the cabins of their inboard or outboard "cruisers," may now use this convenient reduced-sized chart volume to check their positions by merely turning to the sheet showing the desired locality.

The Inland Route extends from Cheboygan, on Lake Huron, to Conway, at the west end of Crooked Lake, and includes Mullett, Burt, and Pickerel Lakes. Sheets showing these last three lakes in their entirety are also in this publication.

Copies of the new chart may be purchased for $1.00 each at the U. S. Army Engineer District, Lake Survey, 630 Federal Building, Detroit 26, Michigan, or by mail order sent to the same address. It is requested that mail orders include money order or bankable remittance of appropriate amount in United States currency, drawn to the order of the Treasurer of the United States.

NEW SERVCO RIBBON FLAGGING FOR SURVEYORS AND ENGINEERS

Never Before a Flagging Tape like SERVCO!


Pocket size roll
Colorfast flagging
Tears off clean
Won't slip off roll
Flexible at low temperatures
Mold and mildew resistant
Won't rope or curl
Marks easily with ball pen, soft pencil or crayon

Originated by a firm specializing in supplying engineers and surveyors equipment, SERVCO FLAGGING is a product designed especially for you. Made by Surveyors Service Company in 5 brilliant new colors, you'll find SERVCO to be the strongest, thickest, most heavily embossed flagging you have ever used. So outstanding that it is covered by a money-back satisfaction guarantee by Surveyors Service Company. If you don't use SERVCO Flagging Tape now, why not ask your dealer to show you a roll. Or write direct today.

DEALERS IN PRINCIPAL CITIES

SERVCO®

SURVEYORS SERVICE CO.

George A. Greenewald
2021 S. Grand Ave., Los Angeles 7, Calif.
RIchmond 7-0606

ALL KINDS OF FIELD EQUIPMENT AND SUPPLIES
Exclusive Western Distributor WILD / Western Distributor Geodimeter Co.

Geodimeter NASMA

By J. BOYLE

CHIEF SURVEYOR, SURVEY BRANCH, DEPT. OF INTERIOR, AUSTRALIA

THE Survey Branch of this Department took delivery of a Geodimeter NASM4 in April 1959, and in July a serious attempt was made to give the machine a thorough trial.

To test any instrument over a particular distance, it is first necessary that the distance be accurately taped, or precisely measured by some other method. Sides of triangulation chains are not considered sufficiently accurate to be used in the evaluation of this instrument. Travers lines precisely chained by very rigid methods, which would probably be accurate to the order of 1/100,000, were used as trial lines. The only line used for which the distance was very accurately known was a short line in the basement of the Administration Block, Canberra, for which the taped distance was 126.456 feet. The Geodimeter measurement of this line was 126.463 feet, which seemed to substantiate the maker's claim that with care, measurements can be made to an accuracy of a couple of millimeters.

The following brief description of the instrument is somewhat supplementary to the maker's brochure which may be obtained from the Geodimeter Co., 1170 Broadway, New York 1, N.Y.

Compared with the large NASM2, one of which is in use within this Department, the NASM4 is a real lightweight. It is extremely portable and when in adjustment easy to operate.

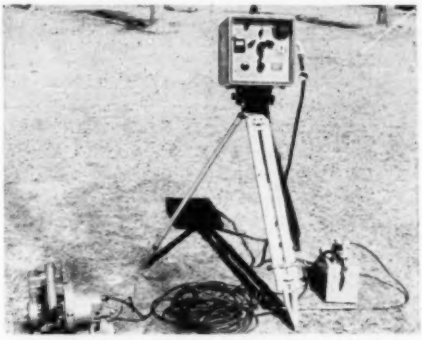
The Geodimeter measures $11'' \times 13'' \times 12''$ and weighs 35 pounds.

The Power Box measures $5'' \times 10'' \times 8''$ and weighs 16 pounds.

The Geodimeter head measures $8'' \times 10''$ diameter, and weighs 11 pounds.

The basic principles for measuring are similar to the NASM2, with the following radical changes in design. The modulating frequency is increased to approximately 30 Mc/s, thus a quarter of a wave length is now 2.5 meters. The large light conductor box and coarse delay systems of the NASM2 have been eliminated by combining the coarse and fine delay settings of the electrical delay line into one unit covering about three meters.

Using calibration curves, the fine scale is readable to the nearest centimeter. With a refined calibration procedure this accuracy could be increased.



Geodimeter, Generator, and Power Box.

Because of the higher modulation frequency, the Kerr cell dimensions are much smaller, and this, together with the decreased dimensions of the optical systems, limits the range of the instrument to three miles, according to the maker. The maximum range has not yet been tested at Canberra.

The focusing system is arranged to eliminate the necessity of applying focus corrections. The warm up period for the instrument is about four minutes.

Most of these details are included in the maker's handbook, and it would be redundant to describe them here.

For field power supply a "Homelite" gasoline driven motor and generator known as Model 15A.115-1 was used. It runs at 3600 r.p.m., and generates 115V., 60-cycle

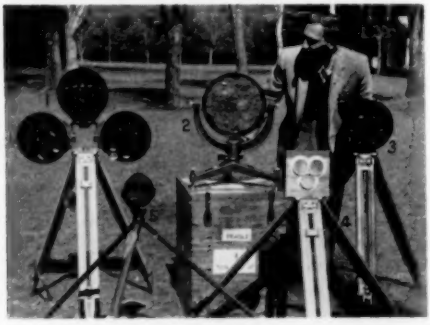
singe-phase AC at 1.3 amp. It is very small and light and is fitted with a carrying handle and spring shock absorbers.

ACCURACY

The maker's brochure claims that the Geodimeter will operate up to three miles with an accuracy of ± ½ inch + 1/500,000 of the distance. No claim is made in the brochure for daylight measurement, but, in correspondence with this Department, the makers claimed the instrument would work in daylight up to one-half mile, and, when great care is taken with the observations, results within a couple of millimeters could be expected. Tests carried out by this Branch would indicate that maker's claims are substantially correct. The accuracy of ± ½ inch + 1/500,000 can be expected under almost all circumstances, even when no great care is taken and observations are cut to a minimum.

DAYLIGHT OBSERVATIONS

Two observations have been taken in Anzac Park, Canberra, on two days, each in bright sunlight.



VARIOUS REFLECTORS

(1) Battery of prism reflectors for daylight observations. (2) A.G.A. plane mirror for daylight observations. (3) Prism reflectors for night observations. (4) Plastic car reflectors for short distances. (5) Helio mirror.

Although the survey party was not equipped with the reflectors considered necessary by the maker, excellent results were obtained by the substitution of a plane-mirror reflector. The maker has stated that a bank of 21 prism reflectors is necessary for daylight observation. It has now been proven that results are obtainable with the plane mirror, but the prism reflectors may give better results.

For these observations the A.G.A. plane mirror was used as a reflector, and it provided a good medium for an adequate return of light. If the sighting telescope in the reflector is in adjustment, and small "Walkie-Talkie" radiotelephones are used to direct the reflector attendant, no difficulty should be experienced in obtaining a stable return of light.

The following tables set out the results obtained.

Anzac Park, Canberra, August 20, 1959, starting time 3:00 p.m., bright sunlight, plane mirror.

Set	Frequencies	Measured Distances (feet) Tape	Geodimeter	Diff. (G – T)
1	1, 2, 3	1015.330	1015.289	– 0.041

Anzac Park, Canberra, August 21, 1959, starting time 11:30 a.m., bright sunlight, plane mirror.

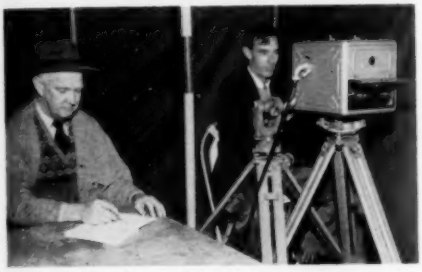
Set	Frequencies	Measured Distances (feet) Tape	Geodimeter	Diff. (G – T)
1	1, 2, 3	1829.580	1829.557	– 0.023
2	1, 2	1829.580	1829.570	– 0.010
3	1, 2	1829.580	1829.538	– 0.042
4	1, 2	1829.580	1829.538	– 0.042
5	1, 2	1829.580	1829.538	– 0.042
	Means	1829.580	1829.548	– 0.032

A further test over a distance of 3,000 feet was made and a fairly good return of light was received, but no measurements were taken due to other commitments for that day.

These results quite definitely substantiate the maker's claim of daylight observation, up to a range of one-half mile. The makers state that for daylight observations a phototube aperature stop of 0.3 mm. diameter is advisable. The above measurements were made without this reduced stop, and when this attachment is received better results are expected to be obtaind.

The Geodimeter and the plane mirror were housed in small tents, which were easily erected. It has not been determined

if the tents are necessary, further exprimentation is needed. The receiver lens was covered with a black cardboard insert, which allowed only about 1/5 of the light bundle to enter the tube, thus considerably reducing the effect of extraneous light.



Daylight observations in progress.

NIGHT OBSERVATIONS

For nighttime observations a prism reflector was used and found to be very suitable. Alignment was not very critical, and if required the reflector could be left unattended. A "Walkie-Talkie" radiotelephone is very handy for directing the reflector attendant, especially when the distances to be measured are considerable.

Aligning A.G.A. mirror.
(Daylight observations)

The results of nighttime observations are tabulated below:

Anzac Park, Canberra, July 7, 1959, starting time 5:30 p.m., dusk to dark, cold and windy, prism reflector.

Set	Frequencies	Measured Distances (feet) Tape	Geodimeter	Diff. (G – T)
1	1, 2, 3	3198.170	3198.180	+0.010
2	1, 2, 3	3198.170	3198.200	+0.030
3	1, 2, 3	3198.170	3198.150	−0.020
4	1, 2, 3	3198.170	3198.120	−0.050
5	1, 2, 3	3198.170	3198.160	−0.010
	Means	3198.170	3198.162	−0.008

City Hill, Canberra, to Mt. Ainslie, July 17, 1959, starting time 6:30 p.m., clear night, prism reflector.

Set	Frequencies	Measured Distances (feet) Tape	Geodimeter	Diff. (G – T)
1	1, 2, 3	9600.050	9600.178	+0.128
2	1, 2	9600.050	9600.139	+0.089
3	1, 2	9600.050	9600.115	+0.065
4	1, 2	9600.050	9600.164	+0.114
5	1, 2	9600.050	9600.164	+0.114
6	1, 2	9600.050	9600.164	+0.114
	Means	9600.050	9600.154	+0.104

The difference in elevation of the two stations was determined by reciprocal angles and measurements were adjusted to a datum plane 2280 feet above mean sea level. Considerable doubt exists as to the accuracy of the measurements by tape, because the measurement was the combined result of two surveyors, each of whom measured part of the line. The last mile of the distance traverses very rough country, up the side of a mountain, with slopes up to 25 degrees.

For these reasons the tape measurement may be regarded as somewhat suspect. There is also some suspicion that the terminal block may have been moved by tree roots.

A further test line was measured in the basement of the Administration Building, Canberra, and the results are tabulated below:

Administration Building, Canberra. Polished metal helio mirror screened to 1-inch diameter. Power supply from 240-volt main, with 110-volt transformer. Receiver lens was not screened.

Set	Frequencies	Measured Distances (feet) Tape	Geodimeter	Diff. (G – T)
1	1, 2, 3	126.456	126.444	– 0.012
2	1, 2, 3	126.456	126.486	+ 0.030
3	1, 2, 3	126.456	126.454	– 0.002
4	1, 2, 3	126.456	126.486	+ 0.030
5	1, 2, 3	126.456	126.454	– 0.002
6	1, 2, 3	126.456	126.454	– 0.002
	Means	126.456	126.463	+ 0.007

Several lights were burning in the corridor in which the measurements were made, but care was taken to have the lights behind both the Geodimeter and reflector screened. Any light shining directly on the mirror must necessarily be screened.

FURTHER TESTS

Further tests will be made both for daylight and nighttime observations. When the bank of prism reflectors suitable for daylight observation and the reduced aperture stop for the phototube are received, trials will probably be made over distances up to one mile, in daylight. It is also proposed to make a check measurement over one of the better bases of the Trig Survey at an early date.

PRELIMINARY CONCLUSIONS

Readers should form their own conclusions from these observations. It is believed, however, that the maker's claim of $\pm \frac{1}{2}'' + 1/500{,}000$ of the distance can be easily substantiated, even for very quick, rough, observations.

It is also believed that distances up to three miles can be measured with an accuracy of 0.02 foot, and probably better under favorable conditions.

The instrument will undoubtedly have many uses, some of which have not as yet been considered.

In the survey and subdivision of large areas for new towns and cities, its uses for survey control purposes are unlimited, and this probably will be its field of greatest use in Canberra.

It is an instrument well adapted for baseline measurement; and precise engineering surveys, such as determination of long bridge spans or dam deformations. A base line six miles long could be measured in one night. First order traverse where lines are too short for determination by the Tellurometer, and trilateration with suitable sides, could easily be fields where its use might be very valuable. Coordination surveys, through built up cities, for the control of new surveys, could be dealt with adequately by this instrument.

There would undoubtedly be many other uses suited to specific requirements of the individual users.

A manual covering complete operation and adjustment is in course of compilation.

This article has been intentionally kept free of highly technical considerations, and has been written in general terms only.

There are, however, certain aspects which can affect results. These include uncertainty in the determination of atmospheric conditions, and the use of power directly from the electric mains. The value for conversion from meters to feet, and the speed of light are controversial, and the acceptance of some values for these could cause minor variations in the final measurements.

ACSM Joins FIG

ACSM President George C. Bestor, reporting from the September 1959 FIG Assembly in Cracow, Poland, informs us that the ACSM's application for affiliation with FIG was approved, and that, pending completion of documentation by the new FIG Bureau, ACSM is now a member of the International Federation of Surveyors, being the second United States member. The other United States member is the American Institute of Real Estate Appraisers. ACSM is already underway with plans for participation in the Tenth International Congress at Vienna, in the host country, Austria, in 1961.

—WALTER S. DIX

Random Lines on Map Drafting

By JOHN E. ASHER*

WHEN a man takes unto himself the label of Map Draftsman he may perchance have a lot of skill of hand, eye, and brain or he may have little. He may be a mathematician or, on the other hand, have but a smattering of geometry. Possibly he lays out base maps, plots contours or airstrips. He may build photogrammetric maps or edit road maps for the motoring public or, on the other hand, execute the crudest kind of sketches with limited skill and versatility. Just what is a mapmaker supposed to offer? Who can tell by his title of Map Draftsman?

When he is employed to work on maps there is no guarantee that he is an expert—no real protection for the agency than engages him unless perhaps he has been able to cook up a flattering specimen of his work from a previous job. He certainly was not educated to be a map draftsman, for there were no such courses available in his school days. When a doctor or lawyer is hired the employer can derive some sense of security from the college degree, the State license, and the professional society affiliation.

Today, mappers are employed on the basis of past experience, skill of hand, educational background, and character—in that order. There is crying need for a more or less formal cartographic education that will carry some weight in the business world. Many of our largest industrial and governmental enterprises would be helpless without maps. Planning and development in many activities which utilize large areas of the earth's surface, subsurface, and stratosphere are dependent upon maps in numerous phases of their operations. Maps comprise an indispensable tool in commerce. This tool like other vital tools, must be good to be efficient.

Frequently surveying and mapping have been spoken of in the same breath as if they were inseparably associated. In many respects they are separate professions and the sooner they go their own ways and are treated as such the sooner we can launch intelligent training programs for each. Drafting has always suffered from neglect in engineering courses. In their anxiety to cram in classwork directly related to various courses our colleges appear to underestimate the importance of effective graphic presentation. The map draftsman may well be tired of being considered the stepchild of civil engineering.

At the outset we need to get together on definitions. Due in some degree to the preponderance of early government membership in the Congress, we hear the term Cartography associated with map editing and lithographic reproduction. To publishing agencies and commercial printers Cartography means one thing, while to private industry whose direct prints are often made in limited numbers from original tracings or other transparent media the term implies a different meaning. Education, skill, and background required therefore, would seem to be at some variance. In the one, knowledge of typography, materials, and design would be of prime importance. On the other hand independent mappers find need of the additional knowledge of map projections, surveying, legal descriptions, real estate law, and local topographic and geologic conditions, with special emphasis on highway construction, timber, mining, petroleum, or whatever the case may be.

The average college geological or geography major who is accepted for a map-drafting job is sadly lacking in the basic details of the immediate locality around him, to say nothing of more distant places. He has far from a speaking acquaintance with the elementary section and township system overlaying the land and is usually woefully ignorant of the information needed to construct various basic projections. College courses have thus far hit the high spots

* Chief Draftsman with General Petroleum Corporation; Past President, Oil Map Association of Los Angeles; and former Director and Publicity Chairman, Southern California Section, A.C.S.M.

of geopolitics but have neglected to go into detail on subjects which would enable the graduate to turn practical knowledge into immediate paychecks. Our schools find it impossible to get away from the old concept that all drafting is "mechanical drawing;" that mapping needs no special training of its own. Mappers on the West Coast have been fortunate in that many companies and governmental offices have encouraged the formation of classes in cadastral mapping, State coordinate systems, photogrammetry, basic geology, and related subjects. Local universities and professional organizations have offered courses during the last few years with remarkable results. The success of the effort is demonstrating the need for specific mapping courses, both from the stand point of student and business.

If an organization such as this [ACSM] plans to encourage institutions of higher learning to award degrees in land surveying, then it should also lend its support to the establishment of specific courses to enable men to major in mapping and cartography. The know-how that goes into modern mapping cannot be learned in a day. Many factors go into the composition of accurate and comprehensive maps; source material, astronomy, mathematics, history, surveying, control data, typography, and methods of presentation.

Just as there is more behind surveying than the knowledge of setting up a transit so there is more to making maps than "tracing" someone else's handiwork. Furthermore, we are prone to overlook the fact that as a visual presentation a map has, to a considerable extent, a selling job to do. It is created to deliver information and has failed if it does not effectively accomplish that objective. Many a map has been produced to no good purpose because the draftsman and engineer were ignorant of the principles of good graphic presentation. A good map consists of more than its basic mathematics. Whether projected in the form of blueprint, lantern slide, or magazine cover it is destined for visual use and the ways and means are, therefore, of prime importance. Consequently any training in drafting, particularly in the area of mapping, should include visual presentation and reproduction techniques.

Use of new materials and methods such as scribing, improved typography, wider use of photography, better survey and engineering data—all should be fostered in our civil engineering drafting courses. In the field of typography alone we see great need to improve the legibility of maps.

For the present, mappers who wish to advance their profession must be more than mere tracers. They must acquire that background parallel with their experience which will enable them to originate factual and reliable information and convince others of the economic worth of dependable maps. As accuracy and imagination soar in all phases of engineering and planning, not only must the methods of learning to depict places and things advance to keep pace with the times but must also anticipate things yet to come.

U.S.G.S. Mapping Activities in 1959

During 1959 the U. S. Geological Survey marked its 80th anniversary (March 3, 1959). Topographic mapping activities were carried on in every State, the District of Columbia, Puerto Rico, and the Virgin Islands. A total of 2,439 maps were prepared for printing and distribution, of which more than 1,600 constituted new mapping. A stock of some 30,000,000 maps—about 21,000 different quadrangles—is available now, covering nearly half of the total area of the United States. Nearly 355 permanently marked triangulation stations were established to provide control for areas totaling more than 30,700 square miles. A new 1:500,000-scale map of Tennessee was published, and compilation is in progress on new State maps for Maine, Minnesota, Montana, Nebraska, Nevada, North Dakota, South Dakota, Utah, and Washington. Cooperative programs totaling $4,000,000 were in effect in 34 States, Puerto Rico, and the Virgin Islands, the Federal Government meeting half their cost.

The Status of Education in Surveying

By RUSSELL C. BRINKER

TEXAS WESTERN COLLEGE

THE Civil Engineering Departments of American colleges and universities have generally cut their required instruction in surveying to less than a bare minimum. Search for a spare credit to use in the humanities or science courses continues, and the trend appears certain to further reduce the engineering subjects, including surveying, in engineering curricula.

It is not the purpose of this paper to defend the old fashioned drill-heavy sequence of surveying courses. In passing, it might be noted that the staff members who taught extensive programs—men like Professors Cutler, Zelner, and Boon of Minnesota; Rayner of Illinois; Dodds of Iowa State; Holt of Worcester Polytechnic Institute; and Bouchard of Michigan, to mention just a few—were competent and proud of their profession. The average young surveying instructor of today is neither experienced nor interested in pursuing a lifetime career in surveying, and thereby is handicapped in giving students their credits' worth. A reduction in surveying credits was certain as the fields of science and knowledge expand in some geometric-progression form.

The disturbing factor personally is the change from an engineering curriculum having a practical flavor (which supposedly is the purpose of engineering) to a mathematics-science approach formerly considered more appropriate for a prospective research man. Scientists are in demand and are vital to our national security and welfare. So are research personnel. And so are engineers and surveyors who have filled the gap between the scientist and technician. Civil Engineering, despite its basic orientation pattern along a somewhat different line, is being forced to accompany the electricals, mechanicals, and others into a new kind of program designed to produce top-level scientist-engineers, meanwhile neglecting some basic engineering.

What does all of this have to do with the status of education in surveying? First, so-called upgrading of engineering curricula by including more mathematics and science is fine, *if some means be established for the education and training of thousands of engineers and surveyors to do the kind of professional work that has been done in the past by engineers and surveyors, not by researchers or technicians, and will continue to be necessary in the future.* Provisions for replacement programs are practically nil, although the greatest numerical demand is in the construction, intermediate design, and maintenance areas.

Second, curricula can be changed, but it is impossible to legislate more native intelligence into students. Personal experience at a large and a small State university, and at a large and a small private college, has demonstrated that students differ little country-wide in ability and desire. A majority of college-age boys are interested in a mixture of technical and science courses with some practical applications. Only a small proportion, perhaps 15 percent, have the ability or craving to become researchers or "engineering scientists." Work in down-to-earth practice after graduation is the outlet for the remaining 85 percent of all undergraduate engineers. Civil Engineers live up to their name—they are civil, gregarious, frequently occupy positions requiring contact with the public (as opposed to the average E.E. or M.E.), and are generally expected to have some inculcation in, and appreciation of, practical engineering at the end of their college careers.

Third, a questionnaire sent to about 170 engineering schools provided an answer already known—that surveying instruction in the colleges is decreasing at an alarming rate, and a different philosophy is needed to stem the tide.

The American Society of Civil Engineers

Task Committee's excellent report on the Status of Surveying and Mapping concludes, among other things, that (1) land surveying, surveying for design and construction, geodetic surveying, and cartographic surveying are recognized as Civil Engineering; (2) deletion of surveying courses is not so bad because more time is allowed for better all-around development in additional sciences; (3) certain surveying assignments are professional, others are in the technician class; (4) teaching of the highly specialized aspects of the survey (or geometronic) engineering field could be restricted to a relatively few universities; and (5) a course in basic surveying is recommended for the curricula of all engineering colleges to provide fundamental concepts of geodetic relations, etc.

Except for item (2), these are simple statements comparable with the axiom that virtue is good. Surveying is part of civil engineering, is professional, and should be so considered. No argument there, although it appears to me that the A.S.C.E. is recognizing this fact rather late. Deletion of

TABLE 1

REPORTS ON SURVEYING AND PHOTOGRAMMETRY CREDITS, SUMMER SCHOOLS AND CAMPS

Year Made	Author	Schools Replying	Schools Included in Table	Req'd Credits		Number Having Summer		Separate Course in Photogrammetry	
				Aver.	Range	School	Camp	Required	Elective
1936	O. S. Zelner[1]	155	73			19	54		
						Avg. 4.4 wks.			
						33% camps			
1937	P. H. Underwood[2]		70	14.3	7–28		39		
1948	R. C. Brinker[3]	153	153	11.3			78		
						Avg. 5.6 wks.			
						42% camps			
1952	E. C. Wagner[4]	96	96	11.4	4–20		45		
						Avg. 5.3 wks.			
						47% camps			
1958	R. C. Brinker	158	158	7.7	0–21⅓	27	24	15	44
1951	R. C. Brinker[5]	145	145	2.6	½–4			16	41
1957	J. G. McEntyre[6]	149	139	2.4	1–4			16	48

[1] SUMMER SURVEYING CAMPS AND SCHOOLS IN THE UNITED STATES AND CANADA, O. S. Zelner, University of Minnesota. *Journal, A.S.P.E.*, April 1937, p. 614.

[2] THE CONTENT OF THE COURSES IN SURVEYING FOR CIVIL ENGINEERING STUDENTS, P. H. Underwood, Cornell University. Unpublished.

[3] A STUDY OF SUMMER SURVEYING CAMPS AND SCHOOLS IN THE UNITED STATES AND CANADA, R. C. Brinker, University of Southern California. *Journal, A.S.P.E.*, January 1949. *C. E. Division Bulletin, A.S.E.E.*, February 1949.

[4] SUMMARY OF COURSE CONTENT AS NOW GIVEN IN CIVIL ENGINEERING CURRICULUMS, E. C. Wagner, University of Wisconsin. *Proceedings, 3rd National Surveying Teachers' Conference, 1952.*

[5] A STUDY OF THE STATUS OF PHOTOGRAMMETRY IN THE ENGINEERING SCHOOLS OF THE UNITED STATES AND CANADA, R. C. Brinker, Virginia Polytechnic Institute. *C. E. Division Bulletin, A.S.E.E.*, May 1951. *Photogrammetric Engineering*, June 1951, p. 432.

[6] THE STATUS OF PHOTOGRAMMETRY IN THE EDUCATIONAL INSTITUTIONS OF THE UNITED STATES, J. G. McEntyre, Kansas State College. *Photogrammetric Engineering*, April 1958, p. 246.

some surveying credits was not catastrophic 20 years ago when there was meat to be cut, but once started, curricular surgeons are hacking deeply into the bone and marrow. Even the recommended basic course is in danger, in fact has been eliminated at two prominent engineering universities. If all surveying is knocked out of civil engineering, and later something must be cancelled so it can be replaced, the task will be a monumental one.

It is agreed that teaching highly specialized aspects of surveying must be relegated to a few colleges, perhaps in options or graduate work, in order to have classes of reasonable size. But where will the advanced students be drawn from? Generally, a strong undergraduate program offers the greatest encouragement for graduate work. One basic course at the Sophomore level is not going to stimulate students to enter the surveying field in preference to others.

It is now time to leave philosophy and look at statistics. Incidentally, if three credits in a four-course surveying sequence are dropped to make way for statistics instead of history, the loss is minimized.

The number of reports made on the status of surveying over a period of 22 years indicates a long-standing uneasiness about the stability of the credit situation. Table 1 lists the successive reports and their condensed results. After dropping from an average of 14.3 required semester credits in 1937, to 11.3 in 1948, the figure held firm through 1952. The number of surveying summer schools and camps increased, probably as a result of the attempt to put more laboratory work in the summer. In the period from 1952 to 1958, the average required surveying content has dropped to 7.7 credits. Impossibility of interpreting the brief answers on summer schools and camps in the recent questionnaire prevents making a comparison in this phase, but it is known that five colleges have dropped their camps in the past few years. Several of these are mourned by the department heads and/or staff, as administrative casualties, perhaps budget inspired.

A few institutions have cut field work in surveying, but to one who believes that some is absolutely required, it is encouraging to learn that most schools are continuing laboratory sessions with their lectures. The trend to move more surveying into the summer has slowed, if not halted. Five colleges gave all of their instruction in the summer in 1948, eight are doing so now. If a staff member confines his teaching to a few weeks in the summer, what incentive—or chance—does he have to maintain interest and efficiency? Physics, mathematics, and chemistry professors are not expected to function on that kind of schedule.

A minor part of this study was the determination of the status of a newer subject, photogrammetry. In the past seven years, the number of required and elective courses in photogrammetry has held steady.

Table 2 gives a comparison of the surveying credits required at practically all American colleges (and a few Canadian schools) offering Civil Engineering degrees. Some other institutions are included also. Originally it was planned to contact only a small number of representative schools, but enthusiasm overcame reason, and a complete sampling was attempted. Specific increases or decreases in a three-year period were considered important. On the basis of incomplete returns, 24 cut their requirements for civils, and 10 for non-civils, last year; 16 reduced their C.E. requirements, and 9 their non-C.E. programs this year; and 25 plan to decrease their credits in 1959–60 for civils, 8 for non-civils. Only four increases are proposed or in effect for the three-year period. Some comments accompanying the returns were emphatic in stating that the cuts had been contrary to the wishes of the Civil Engineering Department head but had been made anyway by higher administration.

Elective surveying credits are available at many colleges. Often the courses are listed in the catalog but seldom if ever given because of insufficient demand and promotion. Graduate work is actively prosecuted at Cornell University, and at the Institute of Geodesy, Photogrammetry, and Cartography of the Ohio State University. The latter institute has students enrolled for the

TABLE 2

SURVEYING SEMESTER CREDITS, REQUIREMENTS AND CHANGES

Institution	Required Surveying Credits							Change in Required Credits			Separate Course in Photogram.
	1937	1948	1958	Reg. Term C.E.	Reg. Term Other	Summer C.E.	Summer Other	57–58	58–59	59–60	
Akron, Univ.	10	9	6	4		2	2[b]	−2	−2[a]		Being consid.
Alabama Poly.			8⅔	8⅔	2			−⅔			Req'd.
Alabama, Univ.	11	8⅔	6⅔	4⅔		2					Elect.
Alberta, Univ.		14									
Antioch Coll.		6	2	2	2					−1	
Arizona State			6	6				Dec.[x]		−3	Elect.
Arizona, Univ.	10	12	3	3					Dec.		Elect.
Arkansas, Univ.		13	12	6	3	6					
British Col., Univ.		12	10	4	1	6	2, 4				Req'd.
Brooklyn Poly.		15	13	9		4				−2	Elect.
Brown Univ.		1	0	Required of seniors, no credit given.							
Bucknell Univ.	16	18	8	5		3		−1, −2[n]			
Calif. Inst. Tech		14	2⅔	2⅔							
Calif., Univ.		8	2*	2*	2*						Elect.
Calif., Univ. L.A.		9	2*	2*	2*						
Carnegie Inst.	17	10	3	3					−3		
Case Inst. Tech.	17	18	4½	4½				*	−4		
Catholic Univ. Amer.		21	8	8							
Chico State		10	9	6		3					
Cincinnati, Univ.		25	7	7					Dec.		
Citadel		9⅓	8	8	8						Req'd. El.[n]
City Coll. of N.Y.		16	12	9		3				−1	
Clarkson Coll. Tech.		8	7	3		4				−1[z]	Elect.
Clemson		16	8	2	2	6					Elect.
Colorado Sch. Mines		9	8				8				Yes
Colorado State		10	7⅓	4⅔	2⅔	2⅔					
Colorado, Univ.		10⅔	8	8	2						Elect.
Columbia Univ.	19	8	7			7	2				
Connecticut, Univ.		6	6	6							
Cooper Union		15	8			8	2				
Cornell Univ.	16	14	13	8	1[a], 3[c]	5					Req'd.
Darmouth Coll.		8	8	3		5			Dec.	Prob.	
Dayton, Univ.		13	11	8		3					
Delaware, Univ.		13	6	6							

TABLE 2 (Continued)

Change in Required Credits

Institution	1937	1948	1958	Reg. Term C.E.	Reg. Term Other	Summer C.E	Summer Other	57–58	58–59	59–60	Separate Course in Photogram.
Dayton, Univ.		13	11	8		3				Dec.	Prob.
Delaware, Univ.		13	6	6							

TABLE 2 (Continued)

Institution	1937	1948	1958	Reg. Term C.E.	Reg. Term Other	Summer C.E	Summer Other	57–58	58–59	59–60	Separate Course in Photogram.
	Required Surveying Credits							Change in Required Credits			
Denver, Univ.		10	7⅓	7⅓						−2	
Detroit, Univ.		11	6⅓	6⅓	2⅔					−⅓[n]	
Drexel Inst. Tech.		7	4	4[x]	2			−⅓			
Duke Univ.		14	8	8							
Florida, Univ.		6	7	7	3					−1[n], −6	Elect.
Fresno State		13	10	10	3						Elect.
Georgia Inst. Tech.	9	8	6 4/9	3 7/9	1⅓[r]	2⅔					Elect.
George Washington U.	13	10	3	3							
Hawaii, Univ.		12	11	8	4[g]	3					Elect.
Houston, Univ.			6	2	2[a]	4					
Howard Univ.		17⅓	10	7		3					
Idaho, Univ.	11	7	7	7	2						Req'd.
Illinois Inst. Tech.		13	8			8	8[p]				
Illinois, Univ.	10	10	10	5	3	5				−2	Elect.
Indiana Tech. Coll.			8	8							
Iowa State	17⅓	14	12	6	6	6				−2	Elect.
Iowa, Univ.	9	9	9	9							Elect.
Johns Hopkins Univ.	Surveying optional. Practically all C.E.'s elect 3 credits.										
Kansas State	18	10	11	11				−3			Req'd.
Kansas, Univ.	13	12	9	9							
Kentucky, Univ.	17½	16	9	4		5			−5[m], −3[n]	+1	Elect.
Lafayette Coll.	9		6			6				+3	Req'd. 59–60
Lamar State Coll.			9	3	1	6					Planned
Lehigh Univ.	15	13	6	3	3[d, e]	3					
Louisiana Poly.		14⅔	12	8	2	4					Elect.
Louisiana State	19	13	13	13	0–4					−2(60)	
Louisville, Univ.	15	14	11⅓	11⅓	⅔						Req'd.
Loyola Univ.			8	8	2						Elect.
Maine, Univ.	19	21	3	3–8							
Manhattan Coll.	13	9	6	4		2	2			−1	
Manitoba, Univ.		18									
Marquette Univ.		8	7⅓	7⅓	2[b]						Elect.
Marshall Coll.		9	8	8	5						
Maryland, Univ.	10	11	6	6					−3, 2[b]		Elect.
Mass. Inst. Tech.	18	15	8	8							Elect.
Mass., Univ.		14	12	6	3	6[■]					

TABLE 2 (Continued)

Institution	Required Surveying Credits							Change in Required Credits			Separate Course in Photogram.
	1937	1948	1958	Reg. Term C.E.	Reg. Term Other	Summer C.E.	Summer Other	57–58	58–59	59–60	
McGill Univ.	20½	24	20⅔?	16⅔?	16⅔	4	4				Elect.
Miami, Univ.			6	6				−3[n]			
Michigan Coll. M&T		14	14	2⅔	2⅔	11⅓	8				Yes
Michigan State	15½	10⅔	8⅔		6	8⅔					
Michigan, Univ.	7	11	10	6	4	4		−1	−2[n]		Elect.
Minnesota, Univ.		21⅓	12	6	1,2,3	6					Elect.
Mississippi State		11	7	7							Req'd.
Mississippi, Univ.	12	16	9	3		6		−3			
Missouri Sch. Mines	11	11	8	8	2			−2			Req'd.
Missouri, Univ.		11[e]	8[e]								
Montana State		12⅔	8⅔	8⅔					−1⅓		
Nebraska, Univ.	12	13	7	7				−1, −2[o]			
Nevada, Univ.	15	13	7	7	3				−3[n]		
Newark Coll. Engr.		9	7½	7½							
New Hampshire, Univ.	12	14	12	12				−2		−3	
New Mexico State	9	9	6	6	2						
New Mexico, Univ.		10	7	7							
New York Univ.	12	12	7	4		3					
N. Carolina State	14⅔	8	6	6							Elect.
N. Dakota Agr.		9⅓	7⅓	7⅓					−2, −⅔[n]		Elect.
N. Dakota, Univ.	14	10	6	6	2					−2[n]	
Northeastern Univ.	25		13[e]	13[e]	3[e,b]						
Northwestern Univ.		6	4⅔	4⅔							Elect.
Norwich Univ.		14	13	7		6					
Notre Dame, Univ.		11	11	7	2[r]	4					Elect.
Ohio Northern Univ.		10	10	6⅔		3⅓	3⅓				
Ohio State Univ.	28	24	6⅔	6⅔	3⅓–6				−10		Req'd.
Inst. Geod., Photo.			21⅓	11	10				+6		Req'd.
Ohio Univ.		10	8	8	3			−1			Elect.
Oklahoma A&M	15	9	9	2	2[r], 4[f]	7					
Oklahoma, Univ.	10	10									
Ontario Agr. Coll.			12	12	5	7	2				Elect.
Oregon State Univ.	11⅓	10	7⅓	7⅓	2						
Penna. State Univ.	20	12	12	8	3–4	4	44				Elect.
Penna., Univ.		10	3	3				−4½	−2½		
Pittsburgh, Univ.	14	13	10	2	2	8	8	−[n]		−1	

TABLE 2 (Continued)

Penna. State Univ.	26	12	12	8	3–4	4	4+					Elect.
Penna., Univ.		10	3	3				−4½	−2½			
Pittsburgh, Univ.	14	13	10	2	2	8	8	−[n]		−1		

TABLE 2 (Continued)

Institution	Required Surveying Credits							Change in Required Credits			Separate Course in Photogram.
	1937	1948	1958	Reg. Term C.E.	Reg. Term Other	Summer C.E.	Summer Other	57–58	58–59	59–60	
Princeton Univ.	11	10	10	7		3	3		−2		
Purdue Univ.	12	11	6	2		4		−4			Elect.
Queen's Univ.			7½	4½	4½[o]	3	3				
Rensselaer Poly.	21	11⅓	9	9	3[r]			−4[su]			Req'd.
Rhode Island, Univ.	8	4	5	5							Elect.
Rice Institute		9	7	7	3						
Rose Poly. Inst.	14	13	10	6		4				−3	
Rutgers Univ.	10	15	11√	7		4			−4, −3[n]		
St. Louis Univ.			6	6	4						
San Diego State			6	6							
San Jose State		10	5	5				−2[n]		−1 to 4	
Santa Clara Univ.		11	8	4		4		Dec.		Prob. S. S.	
Saskatchewan, Univ.		18	16	11	5	5	3				Req'd.
S. Carolina, Univ.	24	12	8	8				−5, −4[n]	+1		Elect.
S. Dakota Sch. Mines		8⅔	10⅓	10	6	⅓					
S. Dakota State		11½	8	8	4[a]			−[a, b]	Dec.	Dec.	Elect.
Southern Calif., Univ.		7	7	7	3[t]						
Southern Methodist		11	11	11	2					−9, −1[n]	
Southwestern La. Poly.		12	9	9	3						Prop. 60–61
Stanford Univ.		6	4⅔	4⅔				−1⅓			
Stevens Inst. Tech.		15	Only surveying is elective 3 credits, senior year								
Swarthmore Coll.		8	6	6	3			−3[n]	−3[n]		
Syracuse Univ.	11	8	8	8				−1			Elect.
Tennessee Poly.		14	8	6		2			−⅓		
Tennessee, Univ.	12	9	8⅔	5⅓	1⅓	3⅓			−2⅔, −2[n]		
Texas A & M	15	10	12	7	1,2	5				−3	Elect.
Texas Tech.		6	6	6	3						
Texas, Univ.	12	14	13	13	1,2						Elect.
Texas Western Coll.		11	9	5	2	4					
Toledo, Univ.		7	8	8							
Toronto, Univ.			19	14	7[o]	5	4				Req'd.
Tri State Coll.			11⅔	11⅔							
Tufts Coll.		9	4	4				−5			
Tulane Univ.	21	19	13	9	2	4				−6, −2[n]	
Union Coll.	11	9	7	3		4		−4[n]			
U.S. Mil. Acad.				3 approx.							

TABLE 2 (Continued)

Institution	Required Surveying Credits							Change in Required Credits			Separate Course in Photogram.
	1937	1948	1958	Reg. Term C.E.	Reg. Term Other	Summer C.E.	Summer Other	57–58	58–59	59–60	
Utah State Agr.		12	7⅓	7⅓					− ⅔	− ⅓, + ⅓[n]	Elect.
Utah, Univ.	9	11⅓	11⅓	8	2[b]	3⅓				− 2, − 2[n]	Req'd.
Valparaiso Univ.			9	6		3					
Vanderbilt Univ.	12⅔	16	8			8	4				
Vermont, Univ.	13⅓	13⅓	12	8	4[e], 4[f]	4					
Villanova Coll.		11	10	10						− 1	
Virginia Mil. Inst.		8	11	11	3						
Virginia Poly. Inst.	15	17⅓	9⅓	5⅓	⅔	4			− 4, − ⅔[a]		Elect.
Virginia, Univ.		10	10½	10½	4½					− 2½, − 2½, − 4½[n]	
Washington State	11	11	11	3	0, 3, 6	8				− 3	(All camp later)
Washington, Univ.		8							Dec.	[n]	Elect.
Washington Univ.	10	9	7	7	3[r], 2[d]				Dec.	[n]	Req'd.
Wayne Univ.		7	7	7	2[a]			− 2[b]		− 1, − 2[a]	Elect.
West Virginia, Univ.	13	13	11	6	2[e]	5					Elect.
Wisconsin, Univ.	21	21	16	10	3[e]	6					Elect.
Worcester Poly, Inst.	20½	12	13	10		3		− 7		− 1½	
Wyoming, Univ.		10	8	8							Elect.
Yale Univ.		6	6			6					
Youngstown Univ.			7	6		1					

[a] Electrical Engineers
[b] Mechanical Engineers
[c] Agricultural Engineers
[d] Geologists
[e] Miners
[f] Forestry
[g] General Engineering
[n] Non-Civils
[p] City Planning
[r] Architects
[t] Petroleum Engineering
[*] Estimated, Catalog
Camp closed
* Engr. Measurements Equiv,
■ Or alternate summer experience
√ Approximate, due to changes

B.S., M.S., and Ph.D. degrees. Sixteen special courses in geodesy (totaling 48 quarter credits), and 13 special courses in photogrammetry (totaling 39+ quarter credits) are offered—in the College of Arts and Sciences, not Engineering! Although these advanced programs have been in operation for many years, there are few if any followers among the colleges which have been traditionally strong in surveying.

A new curriculum at George Washington University, highly appropriate in the Washington, D.C., area, leads to the degree of Bachelor of Science in Cartography. Courses offered include cartography, surveying, photogrammetry, drafting, geology, mathematics, geodesy, geography, and statistics. In addition to courses on the campus, classes are held at three government agencies. Also serving the capital area is the U.S. Department of Agriculture Graduate School which provides courses in surveying, astronomy, photogrammetry, and cartography. Undergraduate and Advanced Certificates are awarded upon completion of the required sequence of subjects.

Several colleges have proposed offering Bachelor of Science degrees in Surveying (the University of Hawaii considered doing so in 1947) but none are known to have followed through. The Texas Surveyors Association educational committee suggested in 1958 that a Bachelor of Science in Surveying curriculum be started in one or more Texas colleges or universities now offering courses in the subject. Similar recommendations have been made elsewhere, but, while well thought out, they have not convinced institutional administrators.

With colleges and universities reducing their surveying and engineering instruction, and none giving a Bachelor's degree in Sur-

TABLE 3

SURVEYING, CIVIL, AND RELATED TECHNOLOGY PROGRAMS
ACCREDITED BY E. C. P. D.

INSTITUTION	CURRICULUM
City College of San Francisco San Francisco, Calif.	Building & Contracting Technology Surveying and Map Drafting
Cogswell Polytechnic Institute San Francisco, Calif.	Structural Design
Franklin Technical Institute Boston, Mass.	Structural Design & Architecture
Univ. of Houston, College of Tech. Houston, Texas	Drafting Technology
Ohio Mechanics Institute Cincinnati, Ohio	Construction Technology
Oklahoma Inst. of Okla. State Univ. Stillwater, Okla.	Building Construction Drafting and Design
Oregon Technical Institute Klamath Falls, Oregon	Surveying Technology Structural Design Technology
Pa. State Univ., Extension Service Univ. Park, Pa.	Drafting & Design Technology Building Construction (Discontinued)
Purdue Univ., Div. of Tech. Insts. West Lafayette, Ind.	Building Construction Technology
Southern Technical Institute Chamblee, Georgia	Civil Technology Building Construction Technology
Wentworth Institute Boston, Mass.	Building Construction Technology
Wyomissing Polytechnic Institute Wyomissing, Pa.	Engineering Technology

veying, what avenue to education and training in Surveying Technology and Civil Engineering Technology is open to the student wanting and deserving a strong foundation? The optimum ratio of four or five technicians for every engineer has been widely publicized, but what facilities are available in the form of technical institutes, junior colleges, and adult education centers to train these technicians in surveying and civil engineering?

The only schools having programs in surveying, civil, or related technologies accredited by the Engineering Council for Professional Development (E.C.P.D.) are listed in Table 3. The curricula vary from full

TABLE 4

SURVEYING CREDITS OFFERED—TECHNICAL INSTITUTES, JUNIOR COLLEGES, AND TWO-YEAR PROGRAMS

Institution	Required Surveying Credits (Semester) C.E.	Others	Civil Tech.	Surv. Tech.	Remarks
Bakersfield College Bakersfield, Calif.	6	3			
Arkansas Poly. College Russellville, Ark.	6				Decrease 2 hrs. in 1957–58.
City College of San Francisco San Francisco, Calif.	6		22		
Erie County Technical Inst. Buffalo, N. Y.	6				
Ferris Institute Big Rapids, Mich.	14			2 years	Surveying and Topographic Drafting Technology started in 1957–58.
Fresno City College Fresno, Calif.	6	3			
Gaston Technical Institute Gastonia, N. C.	10				
College of Tech., Univ. of Houston, Houston, Texas			8		
Oregon Technical Institute Klamath Falls, Oregon				35⅓	Decrease −7 in 1958–59; −1 in 1959–60; Photogrammetry required.
Los Angeles Harbor Jr. Coll. Wilmington, Calif.	6				
Pasadena City College Pasadena, Calif.	6	3		1440 hrs.	Clock hours of surveying in 2 years.
Pa. State Univ., Engineering Extension, Wilkes-Barre, Pa.				32	4 credits in camp. Photogrammetry required.
State Univ., of N. Y., Agr. & Tech. Inst., Delhi, N. Y.			8		Increase of 1⅓ for 1958–59; Bldg. Constr. Tech. 2⅔ credits.
Southern Technical Institute (Division of Georgia Tech.) Chamblee, Ga.				14⅔	Photogrammetry required. Building Construction Technology, 4 credits.
Vocational & Adult School Madison, Wis.	18	14			
Wentworth Institute Boston, Mass.			9 (Est.)		

time for 68 weeks, to full time for two years. Some have an additional year, approximately, of cooperative industrial training to complete the requirements for a technician's certificate, or for the degree of Associate in Engineering.

Note that only *two* schools, both on the west coast, give training in surveying technology. Only *one* covers the broad field of civil technology. It is obvious that if the colleges abdicate from engineering and prefer to teach only engineering science, and consider that surveying should be reduced to one or two basic courses, the kind of program that has served as the background for many thousands of successful engineers and surveyors is almost nonexistent. Self-study is rewarding and various correspondence schools supply a helpful service to those eager and persistent enough to push ahead on their own. The need for formal classwork remains, however, and frequently some sort of degree is essential to obtain recognition for civil service or other appointments.

Junior colleges and adult education centers are giving some work in surveying and civil engineering. An extensive 1440 (clock) hour program is given at Pasadena City College and its format might well be copied by similar institutions around the country. Table 4 is not complete, nor is it truly representative of the many junior colleges and institutes offering surveying instruction, but it does give some idea of available curricula. It shows that a student who wants a lot of surveying and does not intend to go on for a Civil Engineering degree, has few choices open.

Many questions have been raised in this paper. A number of solutions, given in order of preference, are suggested.

1. Retain nine tough semester hours of surveying in Civil Engineering curricula designed to educate civil engineers instead of engineering scientists. This means breaking the popular trend of today in most colleges, and is equivalent to stopping "progressive education" in the primary and secondary schools which also swung too far off center. I would split the nine credits into three of Elementary Surveying, three in a rigid mathematical but practical course in Route Surveying, and three in a combination basic astronomy, photogrammetry, and special surveys analysis.

2. Offer a Bachelor of Surveying degree at a few colleges scattered throughout the United States. This should be the goal of the American Society of Civil Engineers, the American Congress on Surveying and Mapping, and the American Society of Photogrammetry. A good advertising program would make these institutions successful by attracting students from nearby States. Numerous requests received personally for information on surveying degree curricula justify this statement.

3. In at least one public institution in each State, offer parallel civil engineering curricula, one oriented toward science, the second toward practice. Make enough surveying courses available for an option in both curricula.

4. In engineering science curricula, reverse the trend to fewer options and, where possible in large schools, offer an option in surveying and mapping to supplement the basic surveying courses required of all students.

5. Increase the content of surveying technology in presently established technical institutes, publicize those now active, and encourage more boys to return to school after a bit of experience. Under the National Defense Education Act of 1958, funds are available for training technicians in recognized occupations requiring scientific knowledge.

6. Establish more technical institutes to give diplomas in Civil Engineering and Surveying (as well as other engineering curricula) based upon courses in mathematics through differential equations, English, chemistry, physics, mechanics, electricity, statistics, contracts and specifications, engineering economy, highways, structures, sanitary engineering, and basic surveying, with options in several areas including surveying. If the existing colleges are not going to fill the huge gap which is developing, as higher education enrollments increase, some new type of technical school must turn out graduates at a level sufficient for ultimate cer-

tification as engineers-in-training by State registration boards.

In conclusion, it is my belief that changes being made in Civil Engineering curricula are desirable, necessary, and could be carried still further for the top 15 percent of "engineering" students who will assume the highest levels of analysis, design, and research. The overwhelming majority of engineering students, however, are likely to benefit more from a program having some practical content, and a grounding in measurements, significant figures, probable error, note keeping, organization of work, and other features that surveying alone has been giving. Surveying, usually scheduled in the Sophomore year, is the first engineering course met by students and provides an ideal spot to introduce the professional aspects of engineering. Unless we are to abandon the American system of "education for all to their own needs," we cannot discard curricula which have proven satisfactory, without making available suitable replacements. Surveying, construction, drafting, intermediate design, and other engineering work will still be done by someone, and the necessary training for these areas is also becoming more intense. Some or all of the six recommendations made will have to be adopted if surveying and civil engineering are to achieve mature, rounded status. I hope that I can have a part in activating such improvements.

ISA Foreign Translation Program Continued

The Instrument Society of America has been awarded a grant by the National Science Foundation to continue the translation and publication of the 1959 issues of English editions of four leading Russian technical journals.

Undertaken as a service to American science and industry, the ISA "Soviet Instrumentation and Control Translation Series," now in its third year, affords an excellent means for U. S. scientists and engineers to become better informed of the latest developments in the field of Soviet instrumentation. It also corrects a situation whereby Russians for many years have been translating scientific English literature while the United States has received much of its knowledge of Soviet activities by word of mouth or through more startling channels such as the launching of satellites.

The four translated publications include the important Soviet journals, *Measurement Techniques* (Izmeritelnaia Tekhnika), *Instruments and Experimental Techniques* (Pribory i Tekhnika Eksperimenta), *Automation and Remote Control* (Avtomatika i Telemekhanika), and *Industrial Laboratory* (Zavodskaya Laboratoriya). Both 1958 and 1959 issues are available at low subscription rates ranging in price from $20.00 to $35.00 per annual subscription. Special rates are offered libraries of nonprofit academic institutions and for a combined order to all four journals.

The Russian original of *Measurement Techniques* was published as a monthly in 1959 by the Committee of Standards, Measures and Measuring Instruments of the Council of Ministers, U. S. S. R. There are approximately 100 pages per issue with articles of particular interest to all who are engaged in the study and application of fundamental measurement.

Instruments and Experimental Techniques is published bimonthly by the Academy of Sciences, U. S. S. R. Over 175 pages per issue deal with articles on function, construction, application, and operation of instruments in various fields of experimentation.

The Russian monthly *Automation and Remote Control* is published by the Institute of Automation and Remote Control of the Academy of Science, U. S. S. R., with approximately 150 pages per issue. It is considered to be the leading Soviet journal in the automatic control field and contains articles on all phases of automatic control theories and techniques.

Industrial Laboratory is published by the Ministry of Light Metals, U. S. S. R. This monthly contains articles on instrumentation for analytical chemistry and physical and mechanical methods of material research and testing. There are approximately 125 pages per issue.

For subscriptions or additional information, write Instrument Society of America, 313 Sixth Avenue, Pittsburgh 22, Pennsylvania.

Audio-Visual Aids on Surveying, Mapping, and Photogrammetry

By KENNETH S. CURTIS

PURDUE UNIVERSITY, LAFAYETTE, INDIANA

THE original compilation of films on surveying, mapping, and photogrammetry (1952) and a supplemental listing (1956) have been published previously in SURVEYING AND MAPPING.[1] Much interest has been shown in this compilation and, instead of publishing another supplement at this time, it seems desirable to reprint the entire group of audio-visual aids, so that it may be available in one reference source.

"Because it strikes the intellect and emotion simultaneously during a period of high concentration, a film can impress knowledge on the mind quicker and be retained longer than most other mediums of instruction."

During the past two decades a number of films on surveying and mapping have been produced by industrial concerns and by various government agencies. The availability of these worthwhile audio-visual aids provides an opportunity to show something, whether it is motion, processes, techniques, sequences, or methods, which otherwise would be almost impossible. In the original compilation of this list, the intention was to select films that could be used to supplement teaching in the subject-field of surveying and mapping. However, many of these films would be of general interest and valuable as a film program at various technical meetings.

Any film naturally has its limitations and cannot be an end in itself, showing every phase of a subject. There is always more that must be explained in a general class discussion. This should be anticipated and, therefore, the suggestion is made that each film be previewed before use, so that the instructor has a thorough knowledge of its content. Previewing is necessary also because some films may be too advanced and others too elementary for inclusion in a particular college course. The purpose and main points to be stressed should be reviewed and discussed with the class prior to showing.

These aids should be used to supplement one's teaching and to make a clear and forceful presentation of the subject by creating interest, emphasizing important points, and effectively demonstrating techniques and methods. They are a highly efficient tool, but one must learn when and how to use them. The fact that some teachers have grossly misused films should not deter others from investigating them thoroughly, and with an open mind, for possible benefits.

The producer or distributor of each film is noted in the descriptive text. The complete addresses of the distributors are in a separate tabulation at the end of this article. In many cases the films can be borrowed from local film libraries or local film distributors. Many universities have film libraries from which they can be borrowed. The list designates for each film, whether it is in black and white (B&W) or in color, the running time in minutes, whether silent or sound, the year released, and whether loaned-free or rental-charged. All motion pictures listed are 16 mm. and can usually be purchased from the producer. An attempt has been made to list the films in several general groups according to the subject material.

AERIAL PHOTOGRAPHY

(Also See Photogrammetry)

Aerial Photography; Part I, Introduction: Aerial Camera Types (*TF-1138*).—9 min.,

[1] *See* Curtis, Kenneth S., "Audio-Visual Aids in Teaching Surveying and Mapping," SURVEYING AND MAPPING, April–June 1953, Vol. XIII, No. 2, pages 220–225, and "Additional Audio-Visual Aids," SURVEYING AND MAPPING, January–March 1956, Vol. XVI, No. 1, pages 49 & 50.

1940, U. S. Air Force. Shows the K3B, K7C, and K12 aerial cameras and demonstrates how to prepare the aerial camera for a mission.

An Introduction to Photo Interpretation.—Color, 22 min., sound, 1958, free, Pan American Institute of Geography and History. Introduction to photointerpretation for the discovery and evaluation of natural resources. Shows how the aerial photograph aids the forester, geologist, soil scientist, and hydrologist. Presented by the Pan American Institute of Geography and History in cooperation with The Institute of Inter-American Affairs of the U. S. International Cooperation Administration.

Naval Photography in Intelligence (*MN-5348c*).—B&W, 18 min., sound, 1948, free, U. S. Navy. Presents the story of naval photographic reconnaissance during World War II, plus the role of naval photography in the postwar era. Also demonstrates the use of photography for industrial surveys and long-range topographic mapping.

Photo Canada.—Color, 30 min., sound, 1948, rent, National Film Board of Canada. Story of the aerial mapping of Canada's vast north. Photographic detachments of the Royal Canadian Air Force are producing the "mosaic" from which will be drawn an accurate new map of Canada.

Photogeology—A New Look for Oil.—Color, 22 min., sound, 1951, free, Geophoto Services. A well narrated technical film which shows modern methods of photogeologic evaluation.

A Third Dimension for Oil.—Color, third dimension, 20 min., sound, 1954, special arrangements with Geophoto Services, Inc. The film describes the techniques involved in interpreting aerial photographs for geologic purposes in the search for oil. Film requires special techniques in showing, because it is in third dimension and requires the use of polaroid glasses.

AERONAUTICAL CHARTS

Highways in the Sky (*TF-1-4803*).—Color, 30 min., sound, 1952, free, U. S. Air Force. Depicts in a very good manner the story of preparing aeronautical charts, from their inception through ground control, photogrammetric processes, compilation, reproduction, and distribution.

The Making of Aeronautical Charts.—Color, 15 min., sound, 1953, free, U. S. Lake Survey. Illustrates the complete process of producing an aeronautical chart. Shows receipt of source material and shows the ensuing steps through the compilation stage and the editing process. The final drafting or color-separation process is followed through, along with the photographic steps used in making proofs before the final printing.

The Aeronautical Chart and Information Center has several Air Force technical films on navigation, map reading, and aeronautical charts which are available on a loan basis. These films include:

Aerial Mapping—Photography (*TF-1-4743*)
Aerial Navigation—Map Reading (*TF-1-3460*)
Aerology—Basic Map Reading
Part I—Topographic Symbols (*TF-1-4854*)
Part II—Elevations, Distance, and Grids (*TF-1-4855*)
Part III—Direction, Orientation, and Location With Compass (*TF-1-4856*)
Part IV—Without Compass (*TF-1-4857*)
Part V—Photos and Photo Maps (*TF-1-4858*)
Elementary Map Reading (*TF-1-4570*)
Elementary Map Reading—"X" Marks the Spot (*TF-1-4569*)
Highways in the Sky (*TF-1-4803*)
Aerial Navigation—Maps and the Compass (*TF-1-245*)

CARTOGRAPHIC PROCEDURES

Preparation of Topographic Maps for Reproduction.—Color, 30 min., sound, 1952, free, U. S. Geological Survey. Shows in detail the necessary cartographic preparation of topographic manuscripts for reproduction.

Negative Scribing for Map Reproduction.—Color, 24 min., sound, 1953, free, U. S. Geological Survey. Shows in detail the procedures involved in preparing negatives for map reproduction by hand scribing. Sheet coating, guide copy preparation, and close-ups of various scribing operations and instruments are presented.

How to Make a Good Impression.—Color, 20 min., sound, 1951, free, Harris-Seybold Company. Story of modern offset lithography. It shows a comparison of three basic processes: letterpress, gravure, and lithography.

Photo Reproduction.—Color, 23 min., sound, 1958, free, Eastman Kodak Co. Film illustrates how large and small organizations can boost efficiency and cut drafting costs by putting photo-reduction to work.

GEODETIC SURVEYING

Geodetic Surveying.—Color, 45 min., silent, 1945, free, Coast and Geodetic Survey. Depicts the methods used in developing geodetic control from original reconnaissance surveys to the final office computations, including the erection of the Bilby steel tower, angle measurement, etc. Replaced by *"Surveyors at Work."*

Surveyors at Work.—Color, 25 min., sound, 1957, free, Coast and Geodetic Survey. Depicts the methods used in developing the nationwide geodetic control by the Coast and Geodetic Survey. Illustrates the many uses of this control in planning and engineering.

Transit Traverse for Topographic Mapping.—Color, 25 min., sound, 1951, free, U. S. Geological Survey. Shows in detail the organization of a typical field party and the use of the transit and tape in traversing needed for proper horizontal control in topographic mapping. Prepared for training purposes.

Leveling for Topographic Mapping.—Color, 20 min., sound, 1951, free, U. S. Geological Survey. Shows in detail the use of the U. S. Geological Survey precise level and rod in the development of the third-order level nets needed for proper vertical control in topographic mapping. Prepared for training purposes.

HYDROGRAPHIC SURVEYING

Activities of the Coast and Geodetic Survey.—Color, 22 min., sound, 1953, free, Coast and Geodetic Survey. Gives a brief resume of the primary functions and activities of the Coast and Geodetic Survey, including geodesy, hydrography, photogrammetry, magnetic operations, and other activities. Film obtainable from the Washington office and each district office.

Charting Activities of the U. S. Lake Survey.—Color, 30 min., sound, 1953, free, U. S. Lake Survey. Shows all phases of work done in the preparation of navigation charts—including field surveys, office compilation, engraving, processing, printing, and hand correction of aids to navigation on the printed charts. River flow measurement for hydraulic studies is also shown.

Charting the Seas.—B&W, 24 min., sound, 1948, rent, British Information Service. Shows two surveys being carried out by the Hydrographic Department of the British Admiralty—the first based on visible landmarks, and the second on a remote foreign coast where absence of landmarks makes the task more difficult.

Hydrographic Surveying Operations of the Navy (MN-6755a and MN-6755b).—Color, 40 min., sound, 1950, free, Hydrographic Office, U. S. Navy.

Part 1—Establishing Primary Control Points.—20 min. Describes methods of developing geodetic control, including magnetic observations, azimuth, astronomical positions, and photogrammetric methods of establishing shoreline.

Part 2—Secondary Control and Hydrographic Development.—20 min. Describes erection of signals, tide gages, echo sounding, radar control of vessels, wire-dragging operations, current studies, and final processing of field records.

Hydrography for Charting (MN-7337a and MN-7337b).—Color, 20 min., sound, 1951, free, Hydrographic Office, U. S. Navy.

Part 1.—10 min. Position fixing. Describes methods of fixing vessels' positions by visual fix, radar, and Loran.

Part 2.—10 min. Sounding and dragging. Describes use and operation of echo-sounding equipment and the use and setting out of wire-drag equipment.

Occupying an Oceanographic Station.—Color, 30 min., sound, 1949, free, Hydrographic Office, U. S. Navy. Shows detailed instructions for obtaining sea-water samples and temperature by Nansen bottle lowering and techniques of titration for determination of oxygen content and salinity.

Tides and Currents.—Color, 18 min., sound, 1955, free, Coast and Geodetic Survey. The film describes the scientific explanation for the tides and currents in nature and the way in which they affect our lives. The method of measuring and predicting tides and currents is reviewed.

Wire Dragging.—Color, 15 min., sound, 1954, free, Coast and Geodetic Survey. The film depicts one of the methods used in conducting hydrographic surveys.

Use of the Bathythermograph.—Color, 23 min., sound, 1950, free, Hydrographic Office, U. S. Navy. Shows the procedures in preparing for lowering, recovery, and care of the sensitive apparatus recording ocean depth and temperature.

INSTRUMENTS

Electronic Surveyor.—Color, 10 min., sound, 1959, free, Berg, Hedstrom & Co., Inc. Dem-

onstrates the use of the Swedish-developed Geodimeter (Model 4), an electronic distance measuring instrument utilizing a light beam. Illustrates the use of the more lightweight and portable Model 4.

First in a Hundred Years.—Color, 25 min., sound, 1953, Brunson Instrument Co. Brief comparison of the standard type of American instrument and the Brunson ball-bearing instrument. Shows field stripping and reassembly of the ball-bearing base and also shows the complete assembly of the base.

Introduction to Optics (MN 2449A).—B&W, 17 min., sound, 1944, rent, United World Films, Inc. Illustrates the principles of light waves and rays; to show how light is refracted and reflected, and to explain image formation in relation to concave and convex lenses. Studies these principles as applied to optical instruments.

The Last Word in Surveying Instruments.—Color, 20 min., sound, 1955, free, Kern Instruments, Inc. Shows the manufacturing and use of Kern-Swiss optical-reading surveying instruments. The film includes beautiful photography of some choice Swiss scenery and English narration.

Manufacture and Use of Modern Surveying Instruments.—B&W, 90 min., sound, 1949, free, Wild Heerbrugg Instruments, Inc. Depicts the manufacture of modern European surveying equipment from the raw material to the finished product, and also shows the use of these modern surveying instruments in the field.

Optical Tooling.—Color, 30 min., sound, 1955, free, Brunson Instrument Co. A scientific engineering explanation of how to use the principles of optical tooling in industrial applications.

Tellurometer Microwave System.—Color, 20 min., sound, 1957, free, Tellurometer, Inc. Demonstrates the use of a South African-developed electronic distance measuring system. Shows inventor Wadley using the equipment in a field demonstration; its application in 400 miles of precise traverse in Kenya, East Africa; and propagation trials across a glacier in Switzerland. Produced in the Union of South Africa.

Tellurometer.—Color, 12 min., sound, 1957, free, Tellurometer, Inc. A training film designed to show the actual field operation of a microwave system of distance measurement. Produced in the United States.

MAP READING

Basic Map Reading.—(U. S. Army training films. All five films are black and white, with sound, made in 1945.)

Part I—Conventional Signs (TF-21-2071).—20 min. Presents each sign by first showing the feature it represents, then superimposing the sign over the feature, and finally showing the sign on the map as it appears in relation to other signs on the map.

Part II—Elevation, Distance, and Grid (TF-21-2072).—27 min. Uses drawings and straight photography to explain map symbols for contour lines and to point out how to interpret the concave and convex lines and estimate elevation. Measuring distances and grids.

Part III—Direction, Orientation, and Location With Compass (TF-21-2073).—34 min. A soldier with a map and a compass, lost from his squadron, is given step-by-step instruction in how to use these implements in finding his way back to the bivouac.

Part IV—Direction, Orientation, and Location Without a Compass (TF-21-2074).—22 min. A lost soldier is left to find his own way back with only a map. Step-by-step instruction on how to compute distance and locate objects on the map.

Part V—Photos and Photomaps (TF-21-2075).—23 min. Detailed instructions on identifying terrain features on maps. The size, shape, tone, shadow, and relation to relative objects are main features emphasized in identifying objects.

Topographic Symbols (TF-5-1788).—B&W, 18 min., sound, 1953, free, U. S. Army (released through U. S. Office of Education). Revision of *"Part I—Conventional Symbols (TF 21-2071)"* of series listed above. Shows how to identify natural and manmade ground features by representative topographic symbols. Explains the meaning of the different colors used for features on maps.

By Map and Compass.—B&W, 28 min., sound, 1952, rent, Silva, Inc. A boy and his dad learn how to use the compass and maps, and explore together a region of wilderness and virgin fishing lakes.

Caught Mapping.—B&W, 10 min., sound, 1942, free, General Motors Corporation. This film traces the development from old historical maps up to the modern roadmap, so accurate and up-to-date. Shows field men, automobile road scouts, State highway officials supplying,

checking, and relaying information. Entirely free from advertising.

How to Read a Map.—B&W, 10 min., silent, 1942, rent, Library Films. Shows how to interpret geographic and military maps. Elementary.

Let's Look at Maps.—B&W or color, 11 min., sound, 1950, rent, Virginia State Department of Education. Explains the basic methods of representation and symbols used on maps for natural and manmade features. Actual scenes of Virginia are shown and compared with their map representation. Very elementary.

Maps and Their Meanings.—Color, 15 min., sound, 1950, rent, Academy Films. Shows the meaning of the various color zones on physical maps and illustrates the type of land found in each of these zones. Animated maps, diagrams, and color photography show the effects of altitudes, latitudes, and rainfall on the way man uses the land. Elementary.

Maps and Their Uses.—B&W or color, 10 min., sound, 1951, rent, Coronet. Provides an introduction to the study of special symbols on maps, presents a variety of special-purpose maps, and demonstrates the different uses of these maps and their symbols. Elementary.

Maps Are Fun.—B&W or color, 10 min., sound, 1946, rent, Coronet. Introduces the fundamental concepts of map reading. The principles of scale, symbols, physical and political maps, various uses of color, and how to use a map index.

Maps—Land Symbols and Terms.—Color, 14 min., sound, 1956, rent, Academy Films. Air views and photographs of representative areas of the United States are used in explaining how to interpret land symbols and terms which appear in map legends.

Sport of Orienteering.—Color, 22 min., sound, 1948, rent, Silva, Inc. Intended to develop interest in learning how to use a map and a compass and to promote the sport of orienteering, which includes different games in practicing the use of maps and compasses. Made in Sweden with English sound track.

What Is a Map?—B&W, 11 min., sound, 1947, Young America Films, Inc. By use of animation and special photographic techniques, the concept of maps is introduced and explained, first in terms of a plan of a living room, then in terms of a map of a section of a city. Elementary.

Understanding a Map.—B&W, 11 min., sound, 1952, Young America Films, Inc. Sequel to *What Is a Map?* Explains, by means of models and animation, the relation of a simple map to the territory which it represents.

LAND SURVEYING

Fundamentals of Land Surveying.—B&W, 35 min., sound, 1946, rent, University of California at Berkeley. Illustrates methods of taping over comparatively level ground, and taping over sloping ground using the method of breaking chain. A hundred-foot steel tape is used. Techniques of using the plumb bob, chaining pins, line rods, and hand level, as well as the coordinated use of the plumb bob and tape are stressed.

The Land Is Yours.—Color, 22 min., sound, free, American Title Association (Eastern Division). Deals with the advantages of title insurance, but includes some reference to the survey of property lines.

Our Public Lands.—Color, 28 min., sound, 1958, free, Bureau of Land Management. Illustrates the important role of our public lands in the past, present, and future development of the nation's land resource base. Traces the history of the growth of the public domain and shows the importance and wide variety of Bureau of Land Management programs in widely separated areas.

Property Lines.—B&W, 22 min., sound, 1953, rent, University of Southern California. The purpose of the film is to acquaint the lay people with the responsibilities of the land surveyor. It is "the story of the land and lines that divide the land for ownership" and traces the development of surveying from "rope stretchers" re-establishing boundaries erased by the flooding Nile, to two neighbors in modern Los Angeles disputing their boundaries. One, baffled in the attempt to survey his own lot, calls in a professional land surveyor, who helps them reach a friendly solution.

MISCELLANEOUS

Airplane Changes Our World Map.—B&W, 11 min., sound, 1942, free, Encyclopaedia Britannica Films, Inc. Describes the evolution of world map concepts and how the airplane has drastically reduced travel distances. Sequences include projection distortions, early maps and globes, latitude and longitude, and various projections.

Artillery Orientation by Sun and Star (U. S. Army training films.)

Part I—The Altitude Method. (*TF-6-1678*).

—B&W, 25 min., sound, 1951. Determination of true direction by the altitude method of solar observation. Measurement of angles to the sun, corrections for parallax and refraction, and the solution of the celestial triangle based on the observer's plus altitude and declination of sun.

Part II—The Hour Angle Method (TF-6-1679).—B&W, 10 min., sound, 1950. Determination of true direction by the hour-angle method of celestial navigation.

Flying Surveyors.—Color, 30 min., sound, 1951, free, British Columbia Forest Service. Deals with the use of helicopters in topographic surveying and shows these machines operating at high and low elevations and under a variety of difficult conditions.

Flying the Weather Map.—Color, 25 min., sound, 1944, free, U. S. Navy. Observers determine weather conditions at posts. Features of the map: Various fronts represented by colored lines; symbols indicate precipitation areas, thunderstorms, rain showers, air masses, and pressure areas.

Helicopter as an Aid in Alaska Surveys.—Color, 12 min., silent, 1952, free, U. S. Geological Survey. Shows the use of the helicopter in field operations in the topographic mapping of rugged and remote areas.

Latitude and Longitude.—B&W or color, 10 min., sound, 1947, rent, United World Films. Interprets latitude and longitude as angular distances from given points. Indicates how a position can be determined by latitude and longitude, and uses a sectional globe to show the relationship between angles subtended at the axis and linear distances on the surface of the globe.

Mapping the World.—Color, 25 min., sound, 1958, free, Army Map Service, Corps of Engineers. Shows how the Army Map Service meets the challenge of worldwide mapping by photogrammetric methods. Includes the basic necessity of extending both horizontal and vertical control by showing worldwide surveys of the Corps of Engineers.

Maps and Pioneers.—B&W and color, 23 min., sound, 1950, rent, Virginia State Department of Education. Traces the development of Virginia's map from the late 1500's through the early 1800's when the type of outlines and the symbols used became much like those of our modern maps. The film features three maps made from the actual land survey upon which many other contemporary maps were based.

Maps and Surveys for Reservoirs.—Color, 45 min., silent, date unknown, free, Tennessee Valley Authority. Contains the sequence of operations involved in the cadastral aspects of reservoir surveying and the basic steps of regional topographic mapping by the multiplex process.

Maps We Live By.—B&W, 22 min., sound, 1948, rent, Films of the Nations, Inc. Tells of the new frontiers of mapmaking and map use now being explored to advance the welfare and solidarity of the United Nations. Also describes the history of maps.

Maps for the Army.—Color, 37 min., sound, 1953, National Film Board of Canada. Tells the story of the production of a military topographical map in nontechnical language and gives a broad picture of the methods employed by the Army Survey Establishment of the Royal Canadian Engineers.

Snow Harvest.—Color, 25 min., sound, 1946, free, Soil Conservation Service. The making of snow surveys in the high western mountains showing techniques in the measuring of snow to forecast water supplies for irrigation and other uses. Shows beautiful winter scenery.

Surveying With Kytoon.—Color, 18 min., silent, 1947, free, Little Rock District, Corps of Engineers. Shows a method of triangulation surveying using Kytoons (helium-inflated balloons) and two-way communication.

United States Naval Observatory.—B&W, 10 min., sound, 1955, free, U. S. Navy. Explains the two missions of the U. S. Naval Observatory—determination of accurate time and provision of navigational aids to the sailor and flier. Shows astronomers and mathematicians making observations and calculating star positions.

NAVIGATION

The following films on celestial navigation are available through the Civil Aeronautics Administration. They might be of considerable use in courses in engineering astronomy where definitions of terms concerning the earth, celestial sphere, stars, time, etc., are important. They are all in black and white with sound.

Celestial Navigation (U. S. Navy training films.)

The Earth (MN-83A).—17 min., 1942. Explains the arrangement and meaning of the poles, great circles, parallels, meridians, longitude, latitude, nautical mile, and departure.

Charts (MN-83B).—19 min., 1942. Pictures,

maps, diagrams, and a sound commentary are used to explain Mercator charts, gnomonic projections, and Lambert conformal projections.

Nautical Astronomy (*MN-83C*).—24 min., 1942. Shows the placing of celestial coordinates in relation to the earth. Reveals the use of declination, zenith point, nadir line, and June and September solstices.

Astronomical Triangle (*MN-83D*) *Parts I and II.*—37 min., 1942. How the astronomical triangle is formed and its use in determining the positions of ships on the earth's surface.

Time (*MN-83E*) *Parts I, II, III.*—56 min., 1943. Divides the globe into apparent, sidereal, and mean time; illustrates the use of the chronometer.

Star Identification (*MN-83F*).—17 min., 1943. Discusses the apparent movements of stars across the sky; locates and identifies constellations and 23 basic navigation stars.

Aerial Map Reading (*MN-83M*).—22 min., 1944. How to read an aeronautical chart and the use of the landmarks and features in finding position are studied in this film.

Celestial Navigation (U. S. Air Force training films.)

Introduction and Location of Celestial Points (*TF-1290*).—18 min., 1944. Deals with basic principles of the location of points on the celestial sphere.

Latitude by Polaris (*TF-1545*).—10 min., 1944. Relationship between latitude and elevated pole, position and diurnal path of Polaris, and reduction of altitude of elevated pole. Description of the methods of solutions of the altitude of Polaris by mathematical formulas and the use of tables.

Position Finding on the Earth (*TF-1204*).—15 min., 1944. Explanation of longitude and latitude; determination of geographic position; discussion of the Greenwich hour angle, local hour angle, and sidereal hour angle; and a discussion of celestial triangles and the use of various tables.

Loran for Ocean Navigation.—B&W, 20 min., sound, 1947, free, U. S. Coast Guard. Describes various uses of Loran in ocean navigation.

Radar for Navigation.—B&W, 10 min., sound, 1947, free, U. S. Coast Guard. Shows the use of radar by ships entering harbors.

Loran Comes to Batan.—Color, 28 min., sound, 1955, free, U. S. Coast Guard. A pictorial record of the planning and erection of a chain of Loran stations in the Philippine area. Emphasis is on the Batan Island station, where construction activities are followed from breaking of the ground to on-air operation.

PHOTOGRAMMETRY

(See also aerial photography)

Aerial Mapping Surveys.—Color, third dimension, 25 min., sound, 1952, special arrangements with Robert A. Cummings & Associates. The film describes the technique involved in compiling planimetric and topographic maps from aerial photographs. Film requires special techniques in showing, because it is in third dimension and requires the use of polaroid glasses.

Green Light for Progress.—B&W and color, 20 min., sound, 1958, free, Wild Heerbrugg Instruments, Inc. Shows applications of photogrammetry in various parts of the world.

Making Maps the Efficient Way.—B&W, 104 min., sound, 1958, free, Wild Heerbrugg Instruments, Inc. Manufacture and use of photogrammetric equipment and the application and use of photogrammetric methods both topographic and nontopographic. Excellent commentary by American. The two parts can be shown individually.

The Mapmakers.—Color, 12 min., sound, 1958, free, Canadian Aero Service Limited. Shows the operations of a commercial company in making aerial surveys which result in photogrammetric maps that are useful in natural resource development and in engineering construction.

Multiplex Mapping (*TF-5-1549* and *TF-5-1546*).—Color, 66 min., sound, 1949, free, Army Map Service, Corps of Engineers.

Part I.—26 min. An introduction to the general principles of multiplex mapping; serves to familiarize mapping personnel with the Army Map Service method of preparing topographic maps by stereophotogrammetric methods from aerial photographs.

Part II.—40 min. Concerns the technical procedures of multiplex operational principles of multiplex mapping.

Reconnaissance Mapping With Trimetrogon Photography.—Color, 2½ hours, sound, 1944, free, U. S. Geological Survey and U. S. Air Force. Shows all phases of the work in great detail. Somewhat long; on four reels. To see it at one sitting requires almost three hours. The continuity is divided into 14 sequences, but could be shown one reel at a time for periods of about 45 minutes running time per reel.

Supplemental Control for Topographic Mapping.—Color, 25 min., sound, free, U. S. Geo-

logical Survey. Shows equipment and techniques used by the Geological Survey for determining the elevations of supplemental control points for photogrammetric mapping of areas with various conditions of terrain and vegetation. Includes stadia surveys, triangulation methods, and two-base altimetry.

Topographic Mapping by Photogrammetric Methods.—Color, 90 min., sound, 1947, free, U. S. Geological Survey. Portrays modern technical procedures employed by the Geological Survey in making topographic quadrangle maps, featuring the use of the multiplex method. Originally produced for training purposes.

PROJECTIONS

Global Concepts in Maps.—B&W or color, 10 min., sound, 1948, rent, Coronet. Treats the three main concepts—the globe, distortion, and projection. Cylindrical, conic, and perspective projections are shown.

Impossible Map.—B&W or color, 10 min., sound, 1948, rent, National Film Board of Canada. Illustrates by example the fact that a true picture of the world is possible only when constructed on a globe. Distortion of surfaces when they are flattened is shown by use of a grapefruit. Elementary.

Introduction to Map Projection.—B&W, 18 min., sound, 1948, rent, United World Films. Various types of map projections are demonstrated and the advantages and limitations of each projection are discussed and compared with a map drawn on the globe.

RESEARCH AND DEVELOPMENT

The Surveying Branch of the Engineer Research and Development Laboratories, Corps of Engineers, have several films dealing with their continuing research in surveying and mapping which may be borrowed for "study purposes," but have not been cleared for public showing. These report films include:

Geodimeter Baseline Measurement (*RF-1726*).—Color, 20 min., sound, 1953.

Arctic Tests on Theodolites (*RF-1519*).—Color, 3 min., silent.

Theodolite—01 Second (*RF-1464*).—Color, 16 min., sound.

Vibrating Machine Tests on Theodolites and Transits (*RF-1363*).—B&W, 24 min., sound.

Tower Triangulation—25 Ft. (*RF-1341*).—Color, 24 min., sound.

Engineer Activities of Topographical Section (*RF-1091*).—B&W, 10 min., silent.

Tellurometer (*RF-1841*).—Color, 21 min., sound, 1958.

TOPOGRAPHIC MAPPING

The U. S. Geological Survey has several films dealing step-by-step with the mapping operations used in preparing the standard topographic maps. All of these training films are color, sound, and range in length from 20 to 30 minutes, except as noted. These films include:

Leveling for Topographic Mapping

Transit Traverse for Topographic Mapping

Triangulation for Topographic Mapping

Supplemental Control for Topographic Mapping

Negative Scribing for Map Reproduction

Preparation of Topographic Manuscripts for Reproduction

Topographic Mapping by Photogrammetric Methods (90 minutes.)

ADDRESSES

Academy Films, Box 3088, 800 N. Seward Street, Hollywood 38, California

Aeronautical Chart and Information Center, 2nd and Arsenal Streets, St. Louis 18, Missouri

Air Force, Central Film Exchange, Air Material Command, Wright-Patterson Air Force Base, Dayton, Ohio

American Title Association (Eastern Division), c/o H. Stanley Stine, District Title Insurance Co., 1413 Eye Street, N.W., Washington 5, D. C.

Army Map Service, Corps of Engineers, 6500 Brooks Lane, Washington 16, D. C. (and training stations)

Berg, Hedstrom and Co., Inc., 1170 Broadway, New York 1, N. Y.

British Columbia Forest Service, Attn: Public Relations Division, Chief Forester, Victoria, British Columbia, Canada

British Information Services, 30 Rockefeller Plaza, New York 20, N. Y.

Brunson Instrument Company, 1405 Walnut Street, Kansas City 6, Missouri

Bureau of Land Management, Department of the Interior, Washington 25, D. C.

Canadian Aero Service Limited, 348 Queen Street, Ottawa, Canada

Coast and Geodetic Survey, Department of Commerce, Washington 25, D. C.

Coast Guard Headquarters, Chief, Public Information Division, Washington 25, D. C.

Coronet Films, Coronet Building, Chicago 1, Illinois (and other branch offices)

Eastman Kodak Company, 343 State Street, Rochester 4, N. Y.

Encyclopaedia Britannica Films, Inc., 1150 Wilmette Avenue, Wilmette, Illinois (and other branch offices)

Engineer Research and Development Laboratories, Film Library, U. S. Corps of Engineers, Building 320, Fort Belvoir, Virginia
Films of the Nations, Inc., 62 West 45th Street, New York 36, N. Y.
General Motors Corporation, Film Section, Department of Public Relations, 3044 West Grand Boulevard, Detroit 2, Michigan
U. S. Geological Survey, Map Information Office, Washington 25, D. C. (and regional offices)
Geophoto Services, Inc., 305 Ernest and Cranmer Building, Denver 2, Colorado
Harris-Seybold Company, 4510 East 71st Street, Cleveland, Ohio
Hydrographic Office, U. S. Navy Department, Washington 25, D. C. (and training stations)
Kern Instruments, Inc., 120 Grant Street, White Plains, N. Y.
Lake Survey, U. S. Corps of Engineers, 630 Federal Building, Detroit 26, Michigan
Library Films, Inc., 25 West 45th Street, New York 19, N. Y.
Little Rock District, Corps of Engineers, 300 Broadway, Little Rock, Arkansas
National Film Board of Canada, 1270 Avenue of the Americas, New York 20, N. Y.
Pan American Institute of Geography and History, Room 132, Executive Office Building, Washington 25, D. C.
Robert A. Cummings and Associates, 230 Fourth Avenue, Pittsburgh 22, Pennsylvania
Silva, Inc., LaPorte, Indiana
Soil Conservation Service, 3500 Cleburne Road, Fort Worth 1, Texas
Tellurometer, Inc., 1346 Connecticut Avenue, N.W., Washington 6, D. C.
Tennessee Valley Authority, Maps and Surveys Branch, Chattanooga, Tennessee
United World Films, Inc., Educational Film Department, 1445 Park Avenue, New York 29, N. Y. (and other branch offices)
University of California, University Extension Visual Department, 2272 Union Street, Berkeley, California
University of Southern California, Audio-Visual Services, 3518 University Avenue, Los Angeles 7, California
Virginia State Department of Education, Film Production Service, Richmond 16, Virginia
Wild Heerbrugg Instruments, Inc., Main and Covert Streets, Port Washington, New York
Young America Films, 18 East 41st Street, New York 17, N. Y.

BIBLIOGRAPHY

Educational Film Guide, 1953. H. W. Wilson Company, New York, N. Y.

Index of Army Motion Pictures and Film Strips, October 1951.

Educators Guide to Free Films, 1958, 18th Edition. Educators Progress Service, Randolph, Wisconsin

₹ ₹ ₹

Newfoundland's Medium-Scale Map Coverage Completed

Publication of the last map sheet completing the 1 : 50,000 topographical map coverage of the island of Newfoundland has been announced by the Honorable Paul Comtois, Minister of Mines and Technical Surveys. The map sheet, DASHWOOD POND, covering an area in the southwest corner of the island, a few miles inland from St. Georges Bay, is the last of the series of 170 map sheets of the island to roll off the presses at the Map Compilation and Reproduction Division of the Department's Surveys and Mapping Branch.

Completion of the topographical mapping of Canada's tenth province in less than ten years is the result of much coordinated planning and extensive field work by the Branch's Geodetic and Topographical Survey.

At the time of Newfoundland's entry into the Confederation in 1949, that mapping which had been done covered only limited coastal areas and certain regions of military importance. The Federal Government was faced with the urgent task of establishing geodetic control and of the topographical mapping of the island proper, an area of over 42,000 square miles, and of Labrador, almost four times that area.

Within two years the aerial photography of the entire area and much of the basic geodetic survey work had been successfully completed. Confronted with great areas of almost inaccessible and rough terrain, on the island which could only be crossed by means of a 547-mile rail line, topographical ground survey parties worked from improvised bases on the fringe of such areas and, with the valuable aid of helicopters, completed their part of the job by 1954.

Copies of these maps may be obtained, for the nominal charge of 25 cents each, from the Map Distribution Office, Department of Mines and Technical Surveys, 338 Dalhousie Street, Ottawa, Canada.

The Value of Cartobibliographies and the Technique of Their Compilation

By EDWARD L. CHAPIN, JR.

CHAIRMAN, DEPARTMENT OF GEOGRAPHY AND GEOLOGY,
SAN BERNARDINO VALLEY COLLEGE

STUDIES in geography have demonstrated the usefulness of accurate map information. Maps are indispensable not only in constructing other maps but also in preparing reports, articles, and lectures. Abundant map material is sometimes available for study of specific areas, but too often maps are relatively inaccessible and difficult to find, and those available may not be sufficiently detailed for adequate interpretation.

Map collections are expensive to acquire and store, whereas a compendium of significant information available on maps is inexpensive. Furthermore, such annotation is of real use to both organizations and individuals. The aim, then, in compiling a cartobibliography is to assemble map data from diverse government and private organizations and to present this information in simple, concise, usable form.

The usefulness of cartobibliographical study has been demonstrated by the number of requests for information concerning a cartobibliography of Southern California.[1] As a consequence of this interest, the present study attempts to explain the techniques developed in the cartobibliography of Southern California, in the hope of aiding those who contemplate similar studies for other areas.

PROBLEMS, TOOLS, AND TECHNIQUES

Of the many problems which face the cartobibliographer the following are the most important: locating the maps available for consultation, devising a practical "form" to use when gathering the data, determining the bases for the selection of maps to be included, and, finally, presenting the material in a concise, accurate manner.

The initial problem is one of sources. Suggestions as to government and private organizations which compile, publish, issue, or collect maps can be obtained from persons familiar with maps and their uses, from map collections, or from published references, e.g., *General Cartography* by Erwin Raisz,[2] *Official Map Publications* by Walter Thiele,[3] and *A Bibliography of Pacific Area Maps* by Clifford H. MacFadden.[4] Additional sources of information are Federal, State, county, and private agencies located in the administrative seat and major cities of each political unit.

Address Card

Information regarding names and addresses of organizations having map collections can be obtained from commercial telephone directories, telephone directories of Federal, State, and county agencies, and rosters of State, county, city, and township officials. Assembling this information on Address Cards before visiting a city will save much time in locating the agencies.

Cartobibliography Card

Suggestions as to what basic facts to include on the form-card upon which the data are to be recorded are furnished by such published materials as the *Geographical Review,* the *Bulletin American Congress on Surveying and Mapping* (which became SURVEYING AND MAPPING with the issue of July 1944.—EDITOR), the *Catalog of Maps of Hispanic America,* Publication No. 3,

[1] Edward L. Chapin, Jr., *A Selected Bibliography of Southern California Maps.* (University of California Press—Berkeley and Los Angeles, 1953), 124 pages.

[2] New York: McGraw-Hill Book Company, 2nd ed., 1948, pages 208–234.

[3] Chicago: American Library Association, 1938, pages 119–220, 312–338.

[4] New York: American Council Institute of Pacific Relations, 1941, pages 72–75.

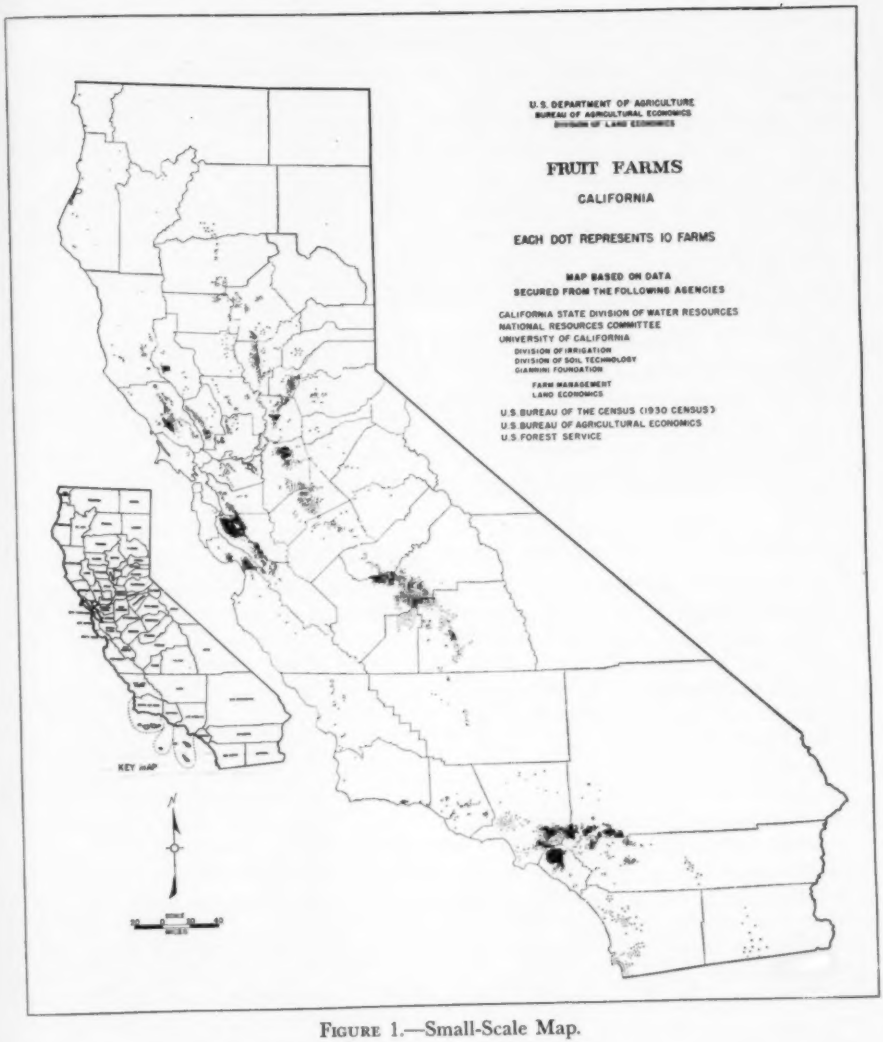


FIGURE 1.—Small-Scale Map.

Vol. I of the American Geographical Society,[5] a *Reference Manual for the Classification, Cataloging, and Care of Map Collections* by Neal Harlow and Andrew H. Horn,[6] and *The Classification and Cataloging of Maps and Atlases* by S. W. Boggs and D. C. Lewis.[7] Map catalog cards of the State Department and the Library of Congress are also helpful. A rough draft of this "form" can be given a preliminary tryout in a map library. As a result of this trial, revisions may be made and the final form, the Cartobibliography Card, can then

[5] New York: American Geographical Society, 1930, page 287.

[6] Los Angeles: University of California, 1950, [typewritten], no pagination, *see* section 1.6, *The Work Sheet.*

[7] New York: Special Libraries Association, 1945, pages 26–64.

CARTOBIBLIOGRAPHY CARD

Area: California Subject: Land Use Title: Fruit Farms in California
Author:
Publisher: U.S.D.A., Bur. Agric. Economics Subtitle:
Div. of Land Economics In:
Scale: 1:3,300,000 Size: 12" x 14"
No. of Sheets 1 Date: Compilation Pub. Rev. Repr. Data Source '30
Projection: Coordinates: Geog. Rn. & Twp. Mil. No.-Ltr. None
Type of Print: Coloring Language:
Source: Univ. of Calif., Los Angeles, Dept. of Geog.
Purchase Source: Price:
Remarks: Fruit farm distribution by dots (1 dot = 10 farms). Boundaries of state & Co's. Insets: Map, "Key Map" - political outline - names of Co's. (1:10,725,000) Notes: Map data secured from: Calif. State Div. of Water Resources; Natl. Resources Comm.; Univ. of Calif.: Div. of Irrigation; Div. of Soil Technology, & Giannini Foundation (Farm Management & Land Economics). U.S. Bur. of Census (1930 Census); U.S. Bur. Agric. Economics; U.S. Forest Serv.

FIGURE 2.—Cartobibliography Card for Small-Scale Map. Solid underlining denotes red ink or pencil; dashed underlining denotes green ink or pencil; and no underlining denotes blue or black ink or pencil.

be printed in quantity. The information gathered on this card is later transcribed to the Final Entry Form.

Additional Equipment

In addition to the Address Card and the Cartobibliography Card, the following items are useful when collecting map data: a Natural Scale Indicator, flexible metal tape, card separators, flexible folders, and a two- or three-color pencil or pen for differentiating various sections of each entry on the Cartobibliography Card.

Criteria for Map Selection

The criteria which govern the choice of maps to be included are map areal coverage, subject matter, usefulness, and date. As regards areal coverage, a preference for detailed information on a political unit or a major part thereof can be used as a general criterion. What subject matter will be of value to the professional and nonprofessional worker can be determined by discussion with responsible individuals in a variety of academic disciplines and business professions. Usefulness of maps, which is considered of utmost importance, involves the selection of a few "key maps," which are indicative of the types found in the agency's collection. The most recent map which contains specific data on an area is cataloged if it was compiled during the twentieth century. If there is a time limit on the project, an effort can be made to gather a selected variety of maps from the many agencies in each city visited. Repetition of map data for the same area and period of time should be avoided and a selection of the best map made where possible. It is worthy of note that forty percent of the 624 maps listed in cartobibliography of Southern California were unpublished; in many instances, these little-known maps, although not published for general distribution, can be consulted and are more useful than published maps.

Final Entry Form

After collecting the data on Cartobibliography Cards, it is necessary to enter the information in simple, concise fashion on the Final Entry Form, so that the reader can ascertain whether the described map would

CALIFORNIA

LAND UTILIZATION

FRUIT FARMS [IN] CALIFORNIA

United States Department of Agriculture, Bureau of Agricultural Economics, Division of Land Economics. Data Source 1930.

1:3,300,000. 12" x 14". 1 sheet. No coordinates.

SPECIAL DATA: fruit farm distribution by dots (one dot represents 10 farms).

OTHER DATA: boundaries of state and counties.

INSETS: Map, "Key Map". Political outline map of California showing names of counties. (1:10,725,000)

NOTES: Map based on data secured from the following agencies: California State Division of Water Resources; National Resources Committee; University of California: Division of Irrigation, Division of Soil Technology, and Giannini Foundation (Farm Management and Land Economics); U.S. Bureau of the Census (1930 Census); U.S. Bureau of Agricultural Economics; U.S. Forest Service.

SOURCE: University of California, Los Angeles. Department of Geography.

FIGURE 3.—Small-Scale Map Entry.

be of value to him. During the collecting period, preliminary tests may be made to determine the most practical organization and form. The following is a "suggested content and explanation" for a Final Entry Form; and Figures 3 and 6 are examples of completed Final Entry Forms.

TITLE OF MAP (Taken directly from the map, if given. If no title on the map, name assigned based on information shown on the map; show same in brackets.)

AUTHOR (Mentioned only if no governmental organization or publishing authority given.) PUBLISHER (The agency from which the map may be obtained, if it is not possible to obtain or see the map in the collection mentioned with the description.) DATE (Includes, if available, date(s) relating to compilation, publication, revision, reprint, or date of source material. If map is unpublished, so stated.) RELATIONSHIP TO ANOTHER PUBLICATION (This information, if available, in parentheses.)

SCALE (Expressed as a representative fraction. If not given, not available.) SIZE (Given in inches, width by height as measured from inside frame lines. If more than one sheet, dimensions given are for assembled map unless otherwise stated.) NUMBER OF SHEETS (Number designates either individual maps, the number of sections of a large map, or the number of individual sheets in a set.) PROJECTION

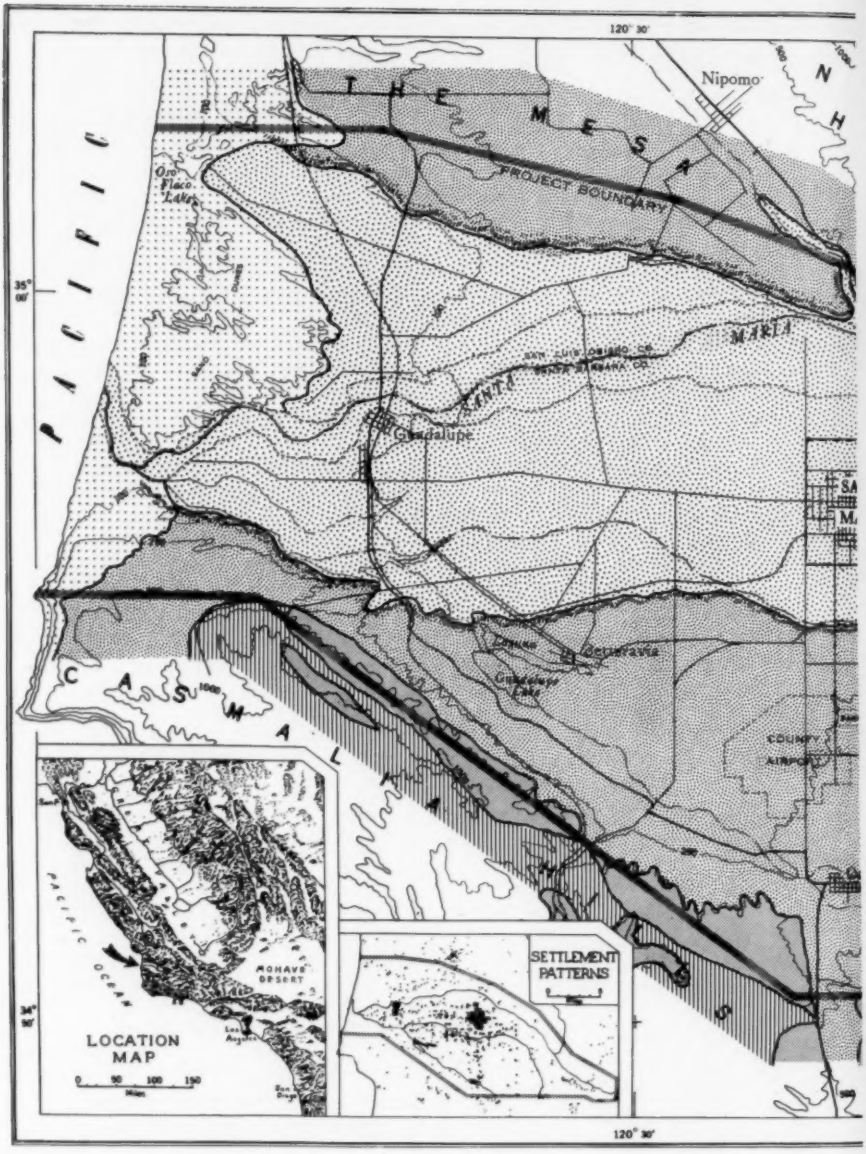
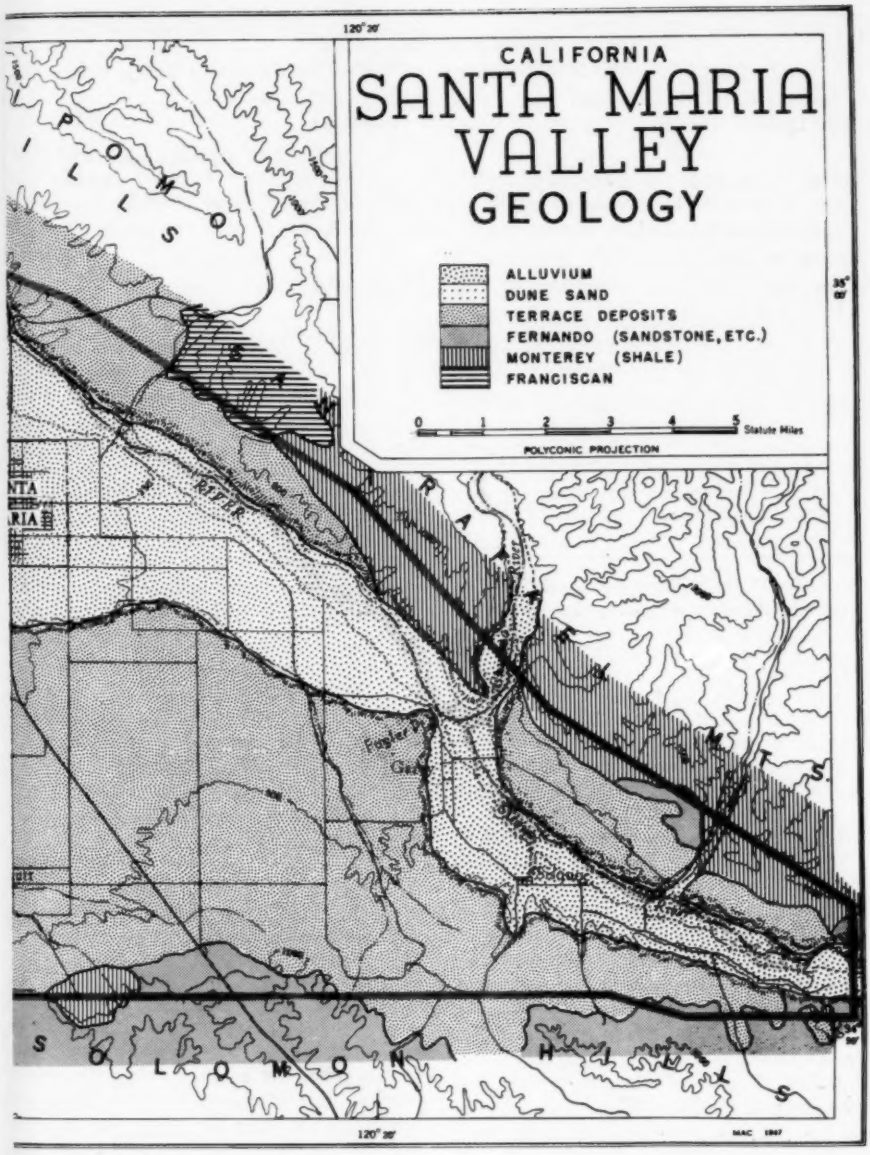


FIGURE 4.—La

(Given only when read directly from map or furnished by map author or publisher.) COORDINATES (Geographic, range and township, military, number-letter, or none.) TYPE OF PRINT (Method of reproduction, if determinable; if original, so stated.) COLORING (Stated as multicolored if more than two colors; otherwise, not stated.) LANGUAGE (Designated only



rge-Scale Map.

if other than English.)

Special Data (Relates to the subject of the map.)

Other Data (All data other than Special Data, i.e., types of relief; hydrography; boundaries of various political units; miscellaneous, e.g., railroads, roads, place names, missions, mines, race tracks, etc.)

CARTOBIBLIOGRAPHY CARD

Area: So. Calif. Subject: Geology Title: Santa Maria Valley, Calif., Geology
Author: C. H. MacFadden
Publisher: Unpub. Subtitle:
In: Santa Maria Valley, Calif., 1948 (PhD Univ. of Mich., Dept. of Geog.)
Scale: 1:121,250 Size: 13½" x 8½"
No. of Sheets 1 Date: Compilation '47 Pub. Unpub. Rev. Repr. Data Source
Projection: Polyconic Coordinates: Geog. ✓ Rn. & Twp. Mil. No.-Ltr. None
Type of Print: Photostat Coloring: Language:
Source: C. H. MacFadden, Univ. of Calif., Los Angeles, Dept. of Geog.
Purchase Source: Price:
Remarks: 6 geol. formations: alluvium; dune sand; terrace deposits; Fernando (Sandstone, etc.); Monterey (Shale); Franciscan. Contours: 100', 150', 250', & 500', mtn. & hill areas named; rivers, creeks, washes, lakes; boundaries: co.'s, cities, airport, parks, dissertation area; rwys., hwys., co. rds., cities & towns (named). Insets: 1) Map, "Settlement Patterns" - settlement pattern S. M. Valley - streams; dissertation area boundary (1:750,000). 2) Map "[Physical] Location Map" - location of S. M. Valley in Calif. (1:10,500,000). Notes: Map area in N. W. Santa Barbara & S. W. San Luis Obispo Co's.

FIGURE 5.—Cartobibliography Card for Large-Scale Map. Solid underlining denotes red ink or pencil; dashed underlining denotes green ink or pencil; and no underlining denotes blue or black ink or pencil.

INSETS (Titles given as on map, diagram, chart, etc., or as derived by investigator; pertinent information listed; scale.)

NOTES (Information about sources of map data and other information supplementary to above and not otherwise provided for.)

SOURCE OF MAP (Where map is available for consultation.) PURCHASE SOURCE (Where map may be purchased, if different from place of consultation.) PRICE (Stated if map is of recent date.)

Small-scale Map Entry (Fig. 3) is derived from Cartobibliography Card (Fig. 2) which in turn is derived from Small-scale Map (Fig. 1). Large-scale Map Entry (Fig. 6) is derived from Cartobibliography Card (Fig. 5) which in turn is derived from Large-scale Map (Fig. 4).

Organization of Entries

All maps cataloged are not necessarily listed in a cartobibliography. The maps selected are placed under one or, in rare instances, two subject categories. In the cartobibliography of Southern California the sequence was determined by two major groupings. The first group, the physical factors, included; Geology, Relief and Hydrography; Climate; Vegetation; and Soils. The second group, the cultural factors, included: Population and Political; Land Utilization; Irrigation and Flood Control; Industry and Mining; and Transportation and Communication.[8] An additional category, Miscellaneous, included the few maps which could not justifiably be placed under one of the other ten headings.

Within each subject category, maps can be arranged by size of area covered and by date. If there are two maps, one showing the entire political unit and the other only a part, the map showing the entire political unit is placed first. If there are two maps showing the same information and area but of different dates, the more recent map takes precedence.

In addition to being cataloged under a

[8] In this instance, the cultural factors were arranged in order of man's occupancy and development of Southern California.

SOUTHERN CALIFORNIA

GEOLOGY

SANTA MARIA VALLEY, CALIFORNIA, GEOLOGY

Clifford H. Macfadden. Compiled 1947; unpublished. (To accompany: Santa Maria Valley, California, 1948. Ph.D. dissertation by Clifford H. MacFadden, Department of Geography, University of Michigan.)

1:121,250. 13½" x 8½". 1 sheet. Polyconic projection. Geographic coordinates. Photostat.

SPECIAL DATA: 6 geological formations: alluvium; dune sand; terrace deposits; Fernando (sandstone, etc.); Monterey (shale); Franciscan.

OTHER DATA: contours (100', 150', 250', and 500' intervals), mountain and hill areas named; rivers, creeks, washes, lakes; boundaries of counties, cities, airport, parks, and dissertation area; railroads, highways and county roads, cities and towns (named).

INSETS: 1) Map, "Settlement Patterns", showing settlement distribution in the Santa Maria Valley area; major stream pattern; dissertation boundary. (1:750,000).
2) Map, "[Physiographic] Location Map", showing location of Santa Maria Valley in California. (1:10,500,000).

NOTES: The area covered by the map is in northwestern Santa Barbara and southwestern San Luis Obispo counties.

SOURCE: Clifford H. Macfadden, Ph.D., University of California, Los Angeles, Department of Geography.

FIGURE 6.—Large-Scale Map Entry.

subject category, each map is included within an area division. In the cartobibliography of Southern California, twelve areal divisions were chosen: California, Southern California, and the ten constituent counties of Southern California; Imperial, Kern, Los Angeles, Orange, Riverside, San Bernardino, San Diego, San Luis Obispo, Santa Barbara, and Ventura. The sequence was established by size and over-all importance for the first two divisions, and by alphabetical order for the last ten. Maps which include information for the entire State were placed under the heading "California." Those maps which included information for parts of two or more counties were placed under the heading "Southern California," thereby eliminating repeti-

tion of the same data under two or more county headings. Finally, maps which included information for only one of the counties or a part thereof were placed under the proper county heading.

INDEX MAPS

Selected Index Maps may be included in the cartobibliography to indicate what areas are covered by a particular type of map, e.g., geologic maps, topographic maps (all scales), vegetation maps, soil surveys, and highway planning surveys. Index Maps of aerial photographs and aerial mosaics may also be included to augment the selected Index Maps.

CONCLUSION

As has been indicated, cartobibliographies have real value and serve a definite purpose in professional as well as nonprofessional work of private and public organizations and institutions concerned with the use and interpretation of maps. This has been adequately demonstrated by the interest shown in the cartobibliography of Southern California.

Cartobibliographies for other areas will help to increase our knowledge of those regions and our understanding of their geography. It would be desirable if the compilation of cartobibliographies were coordinated by an agency such as the American Congress on Surveying and Mapping, or the American Geographical Society. This coordination would prevent duplication and make possible better allocation of areas in need of such studies.

₹ ₹ ₹

A Farewell to Boots and Stetson*

ONE BY ONE those trappings which have characterized the Western engineer in both fact and fiction are slipping into the shadows. The public has always visioned the figure of the bronzed and booted man peering through the transit as symbolizing the engineer who mapped and built the West. Much of the glamor and the romance that were represented by that heroic figure are now departing, thanks to science.

In the old days the college freshman awaited eagerly for the course in surveying and its campus field problems where he proudly showed the lesser students that he was truly an engineer. There was that first day when the instructor held up the tape and said, "This is a chain," confusing enough, but thrilling because it represented the basic instrument for measuring mountains and deserts. And the senior could hardly wait for the day when he donned boots and Stetson—badges of his important position—and first hoisted the transit to his shoulder. He knew that his public knew what he was.

But today, the instructor in the class of modern surveying points to the disc of the Tellurometer and says to the freshman class, "This is to measure distances." With jaunty bow tie and students in clean white shirts, they personify surveying at its electronic best. No longer will these graduates climb the rungs of the ladder from brush-cutter to stake-puncher, to rear chainman and head chainman.

Today these measurers of distance leave their air conditioned offices, board the waiting helicopters and are transported to distant observation points. Stepping out into the mountain breeze, which represents a remaining discomfort, they adjust bow tie and set up the electronic device, pointing it toward the other crew on a distant peak. Dispatching the impulse, they note its return and record a few of these echo-intervals in the notebook. Signaling the helicopter, they take off for the return, commenting that it is good to get out of that awful sun and wind.

Thus have science and progress fashioned a new surveyor and obliterated the symbol that was so typically Western. Progress will be served and the 'copter and its crew of electronic surveyors with notes on their magnetic tape *will* get results faster, and certainly easier. The only question that remains is whether the public can be trained to recognize this newer generation of surveyors, and not expect the man behind the electronic dishpan to step forward and say, "Take me to your leader." —JIM BALLARD

* An editorial written by James I. Ballard, Editor, *Western Construction* and originally published in the September 1959 issue of that magazine. Reprinted by permission.

Surveying and Mapping Literature

Members are requested to send in surveying and mapping news items for publication in SURVEYING AN MAPPING.—EDITOR.

MAGAZINE ARTICLES

General Interest

MORE AND BETTER GEOGRAPHY NEEDED. William H. Hessler, *United States Naval Institute Proceedings*, Vol. 85, No. 12, December 1959. (Stresses need, under present global conditions, for geographic training at pre-college levels and more widespread and thorough training at college and graduate school levels.)

THE SAINT LAWRENCE SEAWAY. John J. Allen, Jr., Under Secretary of Commerce for Transportation. *Marine News*, Vol. 46, No. 5 November 1959. (General discussion of operations and the role of the Department of Commerce in direction and supervision of the Seaway.)

THE MISSISSIPPI RIVER COMMISSION. *Marine News*, Vol. 46, No. 5, November 1959. (An account of the duties and functions of the Commission, organized in 1879 to oversee the harnessing and improving of the lower Mississippi to make its valley safe from floods, which has become an important agency in the field of mapping.)

THE BIG DISH. Rear Admiral Eugene J. Peltier. *The Military Engineer*, Vol. 51, No. 344, November–December 1959. (Notes on progress in construction of the 600-foot radio telescope near Sugar Grove, West Virginina.)

NATIONAL RADIO ASTRONOMY OBSERVATORY. *Science*, Vol. 130, No. 3385, November 13, 1959. (Reviews the early history and development of the observatory at Green Bank, West Virginia.)

MAGNETIC STORMS. E. H. Vestine. *Science*, Vol. 130, No. 3380, October 9, 1959. (Discussion of likely progress in research on the geomagnetic field and related phenomena such as auroras.)

RIVERS IN THE SEA. E. Griffiths. *The Nautical Magazine* (London), Vol. 182, No. 4, October 1959. (General discussion of the Gulf Stream and other principal ocean currents.)

FIRST "PERMANENT BRIDGE" OVER THE SCHUYLKILL, 1805. Noel W. Willis and J. Lincoln Marion. *Civil Engineering*, Vol. 29, No. 10, October 1959. (History of a notable bridge-building project with a comparison of problems and costs in 1805 and the present.)

MULTIPURPOSE INVESTIGATION OF THE BLUE NILE. Alfred R. Golze, U. S. Bureau of Reclamation. *Civil Engineering*, Vol. 29, No. 10, October 1959. (Description of a major project of hydrologic survey by the Bureau of Reclamation and mapping by the Coast and Geodetic Survey.)

OCEANOGRAPHERS NEED SHIPS. Richard Litell. *Science News Letter*, Vol. 76, No. 12, September 19, 1959. (Emphasizes need for ships to permit oceanographers to probe a frontier whose importance to man far exceeds the meager knowledge he has of it.)

AIR SURVEYS AND THE SOCIAL SCIENTIST. Leo Silberman. *Nature* (London), Vol. 184, No. 4682, July 25, 1959. (Reviews some applications of photogrammetry to the social sciences.)

ADMIRAL SIR FRANCIS BEAUFORT. Rear-Admiral K. St. B. Collins, Hydrographer, Royal Navy. *Journal of the Institute of Navigation* (Great Britain), Vol. 11, No. 3, July 1958. (Review of the achievements of Admiral Beaufort, Hydrographer of the Royal Navy, 1829–1855, in surveying and charting, meteorology, and other hydrographic sciences.)

FATHOMETER PROVES HANDY GADGET TO FIGURE GRADING QUANTITIES. *Pacific Builder and Engineer*, Vol. 65, No. 7, July 1959. (Abstracted in *Highway Research Abstracts*, Highway Research Board, National Academy of Sciences, Vol. 29, No. 9, October 1959.) (Describes use of electronic depth sounding equipment to obtain complete profile of area to be filled in constructing embankment for widening highway along Columbia River.)

CHANGING SCOPE OF HIGHWAY RESEARCH. Harmer E. Davis. *News Report*, National Academy of Sciences–National Research Council, Vol. 9, No. 4, July–August 1959. (Traces evolution of road and highway systems and discusses present needs for research in fields of design, construction, and location.)

Cartography

QUALITY CONTROL OF LITHO INKS. Otto C. Stoessel. *National Lithographer*, Vol. 66, No. 12, December 1959. (Describes Aeronautical Chart and Information Center's numerical break-

down system for accurate testing of inks before actual use on press.)

AUTOMATION AND CARTOGRAPHY. Waldo R. Tobler. *Geographical Review*, Vol. 49, No. 4, October 1959. (Explores certain possibilities of the use of computer techniques in the field of cartography.)

THE MARINER AND HIS MAP. Charles H. Cotter. *The Nautical Magazine* (London), Vol. 182, No. 4, October 1959. (Brief history of the development of the nautical chart.)

GENERALIZATION—A PRELIMINARY SURVEY OF AN IMPORTANT SUBJECT. Gosta Lundquist. *The Canadian Surveyor*, Vol. 14, No. 10, October 1959. (Paper on generalization in cartography, presented at the second Rand McNally International Cartographic Conference.)

MAP PRODUCTION. H. J. Benyon. *The Australian Surveyor*, Vol. 17, No. 6, June 1959. (Discussion of various printing processes emphasizing that offset lithography is the most suitable means of map reproduction.)

ADDITION OF PERSPECTIVE TO CONTOUR MAPS. H. W. Patnode and Robert P. Trump. *Bulletin of the American Association of Petroleum Geologists*, Vol. 43, No. 8, August 1959. (Illustrated with maps.)

THE DARK-PLATE METHOD OF RELIEF PORTRAYAL. Joe Frank Wilson. *The International Hydrographic Review*, Vol. 36, No. 1, July 1959.

A NOTE ON THE ADJUSTMENT OF MINOR TRAVERSE NETWORKS. R. Gwilliam. *Empire Survey Review*, Vol. 15, No. 114, October 1959. (Offers simpler method for adjusting traverse networks of a lower order of accuracy and includes specimen computation sheet.)

NOTE ON THE CIRCLE OF ERROR. Hsuan-Lo Su. *Empire Survey Review*, Vol. 15. No. 114, October 1959. (Discusses advantages of a circle rather than an ellipse of error in the determination of coordinates with diagrams and mathematical formulae.)

A METHOD OF DETERMINING ASTRONOMICAL LATITUDE FROM OBSERVATIONS OF A STAR-PAIR NEAR THEIR TIMES OF ELONGATION. J. C. Bhattacharji, Survey of India. *Empire Survey Review*, Vol. 15, No. 114, October 1959. (Description of methods and instruments employed, with tables of computation and experimental results.)

TRIANGULATION BY THE DIRECTION METHOD. J. L. Dixon. *Empire Survey Review*, Vol. 15, No. 114, October 1959. (Critical commentary on a paper by the same title by A. P. Atkinson previously noted in this section.)

USE OF PHOTO-ELECTRIC CELL FOR IMPERSONAL LONGITUDE OBSERVATIONS. Capt. W. D. Rushworth, R. E. *Empire Survey Review*, Vol. 15, No. 114, October 1959. (Describes equipment and methods of overcoming major sources of error in personal astronomical observations.)

A STUDY OF THE ACCURACY OF THE TELLUROMETER. C. David McLellan. *The Canadian Surveyor*, Vol. 14, No. 7, April 1959. (Study of Tellurometer measurements near Kenora and Brandon, Manitoba, with illustrations.)

Education

A NEW WAY TO TEACH CONTOUR MAP READING. John P. Vergis. *The Educational Focus*, (Bausch and Lomb Optical Co.) Vol. 30, No. 2, November 1959. (Suggests use of lines scribed on a lantern slide and projected on an irregular surface to show the theory of contours on a map.)

A MINIMUM EDUCATION FOR PROFESSIONAL CIVIL ENGINEERS. John B. Scalzi. *Civil Engineering*, Vol. 29, No. 10 October 1959. (Discussion of the general philosophy of civil engineering education.)

Instruments

A WAVEGUIDE MAST FOR USE WITH THE TELLUROMETER. A. G. Mungall. *The Canadian Surveyor*, Vol. 14, No. 7, April 1959. (A waveguide mast to elevate the radio antenna of the Tellurometer to 45 feet is described.)

CORRECTIONS FOR TENSION IN A VERTICALLY SUSPENDED SURVEYING TAPE. Marcelle Pearce. *The Australian Surveyor*, Vol. 17, No. 6, June 1959. (Gives mathematical derivation of corrections for the effect of the weight of the tape.)

MODERN INSTRUMENTS FOR SURVEYING AND MAPPING. George D. Whitmore, Morris M. Thompson, and Julius L. Speert. *Science*, Vol. 130, No. 3382, 23 October 1959. (Illustrated description of various photogrammetric plotting instruments and electronic surveying equipments.)

STUDY OF FAST EVENTS. Wendell G. Sykes. *Science*, Vol. 130, No. 3382, 23 October 1959. (Illustrated description of several high-speed cameras and other velocity measuring devices.)

Property Surveys

PLANS AND SURVEYS FOR LAND REGISTRATION IN ENGLAND AND WALES. Lt. Col. A. W. Pritchard, R. E., and C. J. Sweeney. *The Chartered Surveyor*, (Journal of the Royal Institution of Chartered Surveyors, 12 Great George St., Parliament Square, Westminister SW 1, London) Vol. 92, No. 5, November 1959. (Discussion of preparation and preservation of land registry surveys.)

ON APPEAL TO THE DIRECTOR. *Our Public Lands*, Vol. 9, No. 2, October 1959. (Condensed example of a decision showing the detailed research entering into consideration of an appeal in a public land case from the original ruling by

the regional administrator to the Director of the Bureau of Land Management.)

NEW BRUNSWICK PLANE CO-ORDINATES. J. E. Lilly. *The Canadian Surveyor,* Vol. 14, No. 10, October 1959. (Explains and defines the system used.)

COORDINATE CONTROL FOR LEGAL SURVEYS. W. V. Blackie. *The Canadian Surveyor,* Vol. 14, No. 10, October 1959. (Stresses necessity, under modern conditions, of mathematical ties to markers on the ground to assure preservation.)

THE SURVEYOR AND LAND TITLES IN ONTARIO. W. Marsh Magwood. *The Canadian Surveyor,* Vol. 14, No. 7, April 1959. (Discussion of methods of recording or protecting and guaranteeing property titles and the need to more closely relate titles and survey.)

APPLICATION OF PHOTOGRAMMETRY TO FOREST INVENTORY IN BRITISH COLUMBIA. W. Hall. *The Canadian Surveyor,* Vol. 14, No. 7, April 1959. (Description of techniques and instruments employed.)

LAND SURVEYORS DISCUSSION GROUP. *The Canadian Surveyor,* Vol. 14, No. 7, April 1959. (Transcript of a discussion of various problems by a group of cadastral surveyors at the February meeting of the Canadian Institute of Surveying.)

Topography

TACHEOMETERS AND THEIR USE IN SURRVEYING. Jouko Saastamoinen. *The Canadian Surveyor,* Vol. 14, No. 10, October 1959. (Discussion of methods and adaptation of tacheometer measurements as a complement to photogrammetry techniques.)

MUSKEG—A REVIEW OF ENGINEERING PROGRESS. R. A. Hemstock. *The Canadian Surveyor,* Vol. 14, No. 10, October 1959. (Discussion of the problems of muskeg, with a classification of its various properties, including its topography.)

SURFACE TOPOGRAPHY OF THE ANTARCTIC ICE SHEET. Dr. J. F. Nye.. *Nature* (London), Vol. 184, No. 4689, September 12, 1959. (Analysis of the causes of the series of undulations in the Antarctic ice sheet.)

BOOKS AND PAMPHLETS

SOUTH CAROLINA, ROSTER OF PROFESSIONAL ENGINEERS AND LAND SURVEYORS, SEPT. 1959. South Carolina Board of Engineering Examiners, Columbia, 1959. 109 pp.

TEXAS, REGISTERERD PUBLIC SURVEYORS, JULY 1959 ROSTER. Texas Board of Registration for Public Surveyors, Austin, 1959. 55 pp.

GENERAL NORTH CAROLINA LEGISLATION RELATING TO RECORDATION OF MAPS AND PLATS. Robert Montgomery, Jr., comp. University of North Carolina, Institute of Government, Chapel Hill, 1959. 5 pp.

ALABAMA, ROSTER, REGISTERED ENGINEERS AND LAND SURVYORS, 1959. Board of Registration for Professional Engineers and Land Surveyors, Montgomery, 1959. 92 pp.

CONTEMPORARY GEODESY: PROCEEDINGS OF A CONFERENCE HELD AT THE HARVARD COLLEGE OBSERVATORY–SMITHSONIAN ASTROPHYSICAL OBSERVATORY, CAMBRIDGE, MASS., DEC. 1–2, 1958. Charles A. Whitten and Kenneth H. Drummond, editors. Washington, 1959. 95 pp., maps. (National Research Council. American geophysical Union. Geophysical Monograph No. 4.)

HIGHWAYS AND ECONOMIC DEVELOPMENT. Highway Research Board Bulletin 227; National Academy of Science–National Research Council publication 687. Washington, D. C., 1959. 88 pp., illus., diagrams.

MAPPING THE WORLD: A GLOBAL PROJECT OF THE CORPS OF ENGINEERS, U. S. ARMY. New York, Coward-McCann, 1959. 48 pp.

THE EARTH BENEATH THE SEA. Francis P. Shepard. Baltimore, *Johns Hopkins University Press,* 1959. 275 pp., maps.

READINGS IN URBAN GEOGRAPHY. *University of Chicago Press,* Chicago, 1959. 625 pp., maps.

HYDRAULIC RESEARCH IN THE UNITED STATES, 1959. Helen K. Middleton, editor. National Bureau of Standards Miscellaneous Publication 227. Washington, G.P.O., 1959. 188 pp., $1.25. (Order from Superintendent of Documents, Government Printing Office, Washington 25, D. C.)

NEW JERSEY, ROSTER OF LICENSED PROFESSIONAL ENGINEERS AND LAND SURVEYORS. Board of Professional Engineers and Land Surveyors, Newark, 1958. 152 pp.

NEBRASKA, ROSTER OF LAND SURVEYORS. Second annual report, Board of Examiners for Registered Land Surveyors. Lincoln, 1959. 23 pp.

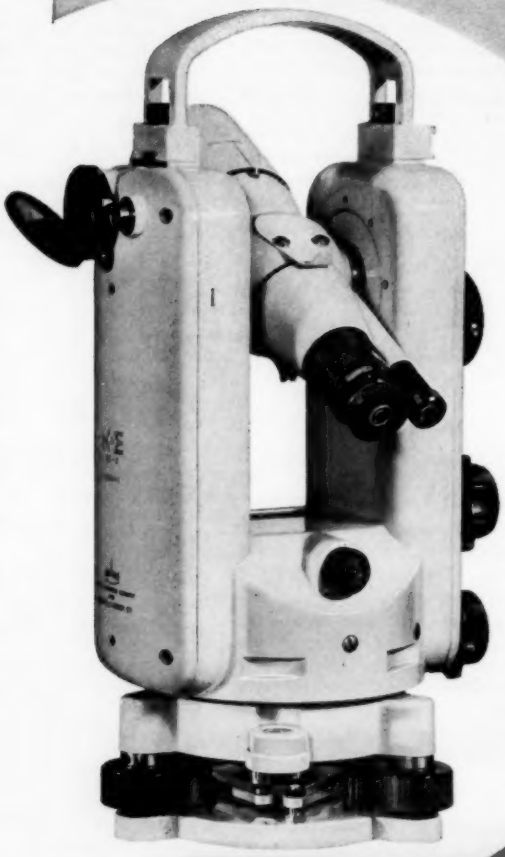
ILLINOIS, ANNUAL ROSTER OF PROFESSIONAL ENGINEERS. Department of Registration and Education, Springfield, 1958. 328 pp.

LYMAN D. LYNN

Coast and Geodetic Survey

now THEODOLITES by K+E

THEODOLITES



Keuffel & Esser Co. proudly introduces three exceptional new Theodolites . . .

The KE-2, reading direct to one second

The KE-1, reading direct to 20 seconds

The KE-6, reading direct to one minute

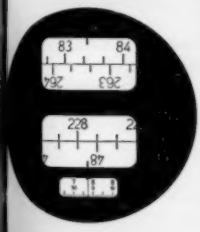
In performance and manufacturing excellence, we at K& regard these theodolites as among the major achievemen in our 93 years of instrument experience, They are built Germany to K&E specifications and standards by wor famous Askania-Werke AG.

Engineered For American Practice

Theodolites designed in Europe, even those widely used in the United States and Canada, have inherently reflected the patterns of European engineering practice. K&E Theodolites however, embody a *new* set of concepts. These three K&E models are the first and only optical reading instruments of this type conforming to American practice. Seven major improvements—a combination exclusive with K&E—characterize the line:

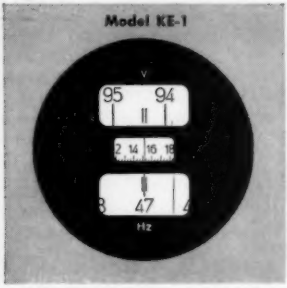
• **Automatic indexing of vertical circle** . . . pendulum system eliminates need for vertical control level, assures accurate vertical angles. • **Choice of erected or inverted image** . . . with either, telescope plunges through both objective and eyepiece ends. • **Leveling head joint system** . . . ball and socket linkage shift between plates, gives instrument a permanently rigid leveling base. • **All control knobs located on one side** . . . for rapid, one-hand operation. • **Simultaneous viewing of both circles** . . . provides faster, easier reading, eliminates the need to switch-over from one circle to the other. • **Optical plummet built into the alidade** . . . affords easy checking simply by rotating 180°. • **Fully interchangeable accessories** . . . designed to work with all K&E Theodolites, eliminating costly duplication.

Model KE-2



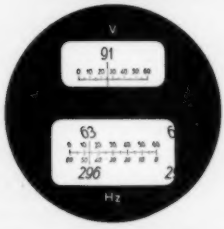
izontal Reading — 228° 17′ 57.6″
Directional Theodolite
• direct reading — 1 second
• estimation — 0.1 second

Model KE-1



Horizontal Reading — 47° 15′ 12″
Repeating Theodolite—Zero setting
• direct reading — 20 seconds
• estimation — 2 seconds

Model KE-6



Horizontal Reading: clockwise — 63° 13.6′, counter clockwise — 296° 46.4′
vertical reading — 91° 25.4′
Repeating Theodolite—Zero setting
(comparable in operation and performance to the standard American transit)
• direct reading — 1 minute
• estimation — 6 seconds
• horizontal circle graduated 360° in both directions

K&E Theodolites are available for immediate shipment in the United States and Canada. Contact your nearest K&E dealer for information — or write directly to Dept. SM-3, Hoboken, N. J., for descriptive literature.

KEUFFEL & ESSER CO.
NEW YORK • HOBOKEN, N. J. • DETROIT • CHICAGO • MILWAUKEE • ST. LOUIS
DALLAS • DENVER • SAN FRANCISCO • LOS ANGELES • SEATTLE • MONTREAL

‡027

Distinctive Recent Maps

The League of Red Cross Societies [Geneva, Switzerland] released in 1959, a *World Red Cross Map, published for the Centenary of the Birth of the Red Cross Idea, 1859–1959.* The colorful, pictorial map identifies countries having a National Red Cross, an overseas branch of an internationally recognized society, or National Societies not yet internationally recognized. Measurements of the map are 32 by 49 inches.

The Known Globe-1667 is a recent facsimile map published and distributed by *American Heritage* magazine. The colorful and attractive map is a reproduction of the *Nieuwe Werelt Kaert* by Pieter Goos. It measures 19 by 24 inches. On the verso of the sheet is a detailed, historical commentary about Goos and his map.

The admission to the Union of the new States of Alaska and Hawaii provides the incentive for publishing new maps of the enlarged United States. A recent accession in this category is Rand McNally's *50 State Map of the United States* at the scale of 1 : 4,000,000. The map, which measures 30 by 48 inches, has insets of the newly added States in the lower left corner of the sheet. In the lower margin the States are listed alphabetically, with date of admission to the Union, present population, capital city, nickname, and State flower and bird.

The National Geographic Society continues the periodic issue of new sheets for its looseleaf atlas. Recent accessions in this series are the *State of Alaska* (Atlas Plate 18), distributed with the July 1959 *National Geographic Magazine,* and *Western Soviet Union* (Atlas Plate 45), a supplement to the September 1959 issue. The former is at the scale of 1 : 4,118,400 and the latter at 1 : 6,336,000.

Petroleum bearing areas are outlined in detail on a map showing *Producing Formations of the Permian Basin,* published in 1959 by Southwest Mapping Company of Fort Worth, Texas. The map sheet measures 65 by 47 inches and the scale is 1 : 250,000.

Chicagoland Panorama is a colorful and eye-catching perspective view of Chicago and its environs. It was published by the Chicago Association of Commerce and Industry. On the verso of the map sheet are a number of illustrations of scenic and recreational centers and a list of "Year-round attractions." The map measures 23½ by 34 inches. Homer Grooman is the artist-cartographer.

The Forestry Branch of Canada's Department of Northern Affairs and National Resources has published a *Map Showing Pulp and Paper Industry of Canada,* 1958. The map is 24 by 34 inches and the scale is 1 : 6,500,000. Pulp mills, paper mills, and pulp and paper mills are located. Mills are listed alphabetically by provinces in a table printed on the map sheet.

Oil and Gas Fields in Western Canada was compiled and published by Petroleum and Natural Gas Development of the Canadian Bank of Commerce, Calgary, Alberta, Canada. It is at the scale of 1 : 2,500,000 and measures 28 by 41 inches. Gas and oil fields are delimited, existing and proposed oil and gas pipelines are shown, and refineries, petrochemical plants, and branches of the Canadian Bank of Commerce are located. Three large sheets of supplementary descriptive and statistical data accompany the map.

East Central British Columbia is a "land-form" or perspective relief map, after the style of Erwin Raisz and the late Armin K. Lobeck. It was compiled and drawn by the Geographic Division, Surveys and Mapping Branch, Department of Lands and Forests, Victoria, B.C. The scale is ten miles to one inch and the size is 30 by 38 inches. In addition to relief the map shows roads, railroads, parks, airports, historic monuments, and other cultural features.

A general plan of the *St. Lawrence Power Project, Prescott to Cornwall* is a 1958 publication of the Hydro-electric Power Commission of Ontario. Located on the map are structures, excavations, park lands, dykes, new town sites, old and new shorelines, and old and new roads and railways. The scale is 1 : 60,000 and the measurements of the sheet are 11 by 51 inches.

Landforms of Mexico is the latest in the series of detailed physiographic maps to come from the skilled pen of Dr. Erwin Raisz. The map, prepared for the Geography Branch, U.S. Office of Naval Research, is "based primarily on airplane photographs and the author's flights and travels," and published topographic maps and aeronautical charts. Physiographic provinces are outlined on a small inset map and briefly described on the map sheet. There is also an inset map showing states and territories and eight small sketches illustrating physiographic symbols. The map is at the scale of 1 : 3,000,000 and measures 27 by 40 inches. Copies, at 75 cents each, may be ordered from Dr. Raisz, 107 Washington Ave., Cambridge 40, Massachusetts.

Several new cartographic publications have re-

cently come from Latin American countries. *Ecuador, Regiones Litoral e Interandina Carreteras Fundamentales* shows various classes of roads, completed and under construction. The map is at the scale of 1 : 1,000,000 and measures 24 by 17 inches. On the same sheet as the main map are enlarged insets of ten Ecuadorian cities. Lists of public buildings, hotels, consulates, etc. for the major cities, are printed on the verso.

Areas Forestales en el Sur del Peru is a black and white map which outlines forest regions of southern Peru. It was published by Servicio Cooperative Inter-Americano del Plan del Sur. Compilers of the map are Dr. Earl E. Smith and Ing. Flavio Bazan. It is at the approximate scale of 1 : 1,300,000 and measures 30 by 23 inches.

Mapa Preliminar de la Republica de Guatemala is a general-purpose and tourist map at the scale of 1 : 750,000. It was published in 1959 by Guatemala's Direccion General de Cartografia. Besides administrative divisions the map shows generalized relief by simple shading, roads, railroads, airports, towns, cities, and various other cultural features. It is 33 by 32 inches in size.

Mapa de Carreteras de Costa Rica is a 1959 publication of Instituto Geografico de Costa Rica. It is at the scale of 1 : 1,000,000 and measures 19 by 23 inches. There are enlarged insets of the city of San Jose and of the central part of the country extending from Turrialba on the east to San Ramon on the west.

The British Directorate of Overseas Surveys issued in 1958 a revised edition of a *Map of British Guiana* at the scale of 1 : 1,000,000. Information presented on the map includes limits of coastal areas, savannahs, sugar and other estates, bauxite, gold, quartz, and diamond producing regions, areas of forest exploitation, airports, airstrips, and landing pools, roads, railroads, and international boundaries. The map measures 34 by 22 inches.

The London Daily Telegraph published, in 1959, a *Constituency Map of Great Britain and Northern Ireland*. Compiled by Geographia, Ltd., the map shows, by colored squares, the state of the several political parties as of September 1959. The map measures 33 by 22 inches. No scale is given.

Physical Map of India is a hypsometric map of the Asian subcontinent. It was published, in 1958, under the direction of Brigadier Gambhir Singh, Surveyor General of India. The scale is 1 : 4,435,200 and the map sheet measures 34 by 36 inches. Railroads, roads, administrative boundaries and centers, and towns and cities are shown.

Malaya 1958 is a 1959 publication of the Survey Department, Federation of Malaya. It is at the scale of 1 : 500,000 and is printed on two sheets, each measuring 30 by 43 inches. The map, which clearly delimits the administrative regions of the country, also shows railroads, roads, towns and villages, and other cultural features.

Carte Geologique de l'Afrique Equatoriale Française was compiled by Georges Gerard and published, in 1958, by Gouvernement Général de l'Afrique Equatoriale Française. It is supplemented by a descriptive text of 198 pages, prepared by the compiler. The map is at the scale of 1 : 2,000,000 and is on four sheets, each of which measures 33 by 23 inches. Formations ranging from early pre-Cambrian to Quaternary are mapped. There is a small-scale inset map showing the structural geology and a list, with index map, recording source materials used in compiling the map and descriptive text.

Commonwealth Railways Map of Australia Showing Railway Systems 1958, was compiled and drawn by Property & Survey Branch, Department of the Interior, Canberra. It is at the scale of 1 : 6,500,000 and measures 22 by 29 inches. Existing railways as well as those under construction are shown, classified according to gauge.

Generalized land use of *Queensland* Province, Australia, is presented on a 1958 map, prepared by the Queensland Survey Office and printed at the provincial Government Printing Office. Areas devoted to cattle, sheep, dairying, and sugar growing are delimited, as well as areas where brigalow scrub occurs, the Great Artesian Basin, and the Channel Country. The measurements are 20 by 12 inches and the scale is 1 : 5,000,000.

WALTER W. RISTOW

Library of Congress

G. P. O. Price List 53

The 49th Edition of Price List 53, "Maps, Engineering, and Surveying," bearing the date of January 1960, is available without charge from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. This list contains the material formerly published in Price List 18, "Engineering and Surveying." Many of the maps and other publications listed are of real interest to surveyors and mappers. Get a copy of the list and see for yourself what a wealth of material is available.

The Surveyor and the Law

Notes on Swamp Lands, Navigable Streams, and Lakes

Recently (Dec. 4, 1959) I was fortunate enough to be asked to speak at the Eleventh Annual Surveyors Institute at the University of Wisconsin. During the course of the program, it was informative and worthwhile to note the differences in water laws.

In the sectionalized land States the beds of the rivers and lakes originally resided in the Federal Government. As patents to lands were issued, the new land owner, adjoining waters, was granted title to the bed of all nonnavigable streams and lakes. The government retained title to the beds of navigable lakes and streams. Upon admission to the Union, title to the beds of navigable lakes and streams passed to the State. After acquiring title, a State could dispose of its rights as it saw fit.

In Wisconsin it appears that the State has relinquished its rights in the beds of lakes to the adjoining land owner. But not so for navigable streams. Further, the State Courts of Wisconsin have taken the attitude that the remotest possibility of navigation makes a stream navigable. I believe the defiinition is, "a navigable stream is any stream capable of floating a log or the lightest possible boat." The test seems to be whether a canoe of the least draft (about 2 inches) is capable of floating and moving after any rain. This in effect means that practically any water course can meet this test at some time during a heavy rainy season.

The State is the sole judge as to matters between itself and its citizens, and such a ruling can be enforced. However, as between the State and unpatented land of the Federal Government, such a State rule would probably not be enforceable. In Oklahoma the State passed a law declaring that under certain conditions a stream was navigable; hence, they owned the bed and the oil under it. But a tribe of Indians objected and the Federal Court decided that they (the courts) were the sole judge as to navigability. In this case the stream was declared nonnavigable; the Indians got the oil.

After the land has been patented by a citizen and the land is repurchased by the U. S. Government, it will undoubtedly be controlled by State laws. Since most government lands of Wisconsin are repurchased lands, the State rule of navigability will probably hold in most cases.

Apparently in Wisconsin the object of trying to declare all possible streams navigable is for the purpose of retaining public fishing rights in the streams. Since I dearly love to fish for trout, I am highly in favor of it, even though there seems to be a tinge of unfairness to it.

In California and many Western States just the reverse is closer to the picture. Under the Spanish rule water can be appropriated. It is far more important to use water for irrigation than it is to permit it to remain in a stream as a fish bath. Few streams are declared navigable; the water is diverted for irrigation. In one State, I believe it is Arizona, they boast that there are no navigable streams. Of course, the fact that they have little water has something to do with it.

In Wisconsin, while the beds of lakes reside in the adjoiners, the State maintains an easement in the water for purposes of navigation and fishing. In order to create a means of access to these lakes, the platting law requires that at half-mile intervals a road shall be provided all the way to the lake. I believe this law to be reasonable and fair. In California (San Diego County) our prize asset is ocean frontage. The County has passed an ordinance requiring the dedication of a street adjoining the ocean and extending all the way to the ocean. Eventually there will no longer be private beach rights. This, of course, is confiscation without remuneration. Frankly, it is a bit sneaky but seemingly legal.

Swamp lands are a special problem in Southern California. The Federal Government meandered and reserved these lands. Upon application by the State, the lands were given to the State. After the State acquired these swamp lands, it sold the lands to private parties. In numerous instances these so-called swamp lands are semifresh lagoons adjoining the ocean. Normally the meander line of a body of water does not constitute the boundary line; the water itself is. In the case of swamp lands the land is supposed to be alternately inundated and dry.

If this is so, it is nonriparian. For this reason the boundary of swamp lands is the meander line and not the water line. We must, in such cases, reestablish lost meander lines.

Swamp lands had to be applied for by the State and granted to the State by the Government. Any swamp land not applied for and duly granted, does not come under the swamp act, and hence does not necessarily possess a meander line as a boundary line.

—CURTIS M. BROWN

ǂ ǂ ǂ

Maps for 1960 Census

A fine example of the use of maps to insure correct statistical reporting is the extensive use of maps of all scales, from 1:600 to 1:250,000, for the use of the enumerators who will be required to track down each individual in the United States during the 1960 census. Each one of the 160,000 enumerators will be given a map of the area he or she is to cover, and these maps will range from diagrams of single, large, apartment houses to areas of several hundred square miles in the sparsely settled areas in some parts of the western States. The Census Bureau has calculated that if all the maps which will be given out were laid "end to end" they would result in a strip 3 feet wide and about 250 miles long—and *that* is a lot of maps. These maps were produced in a temporary mapping office set up in Jeffersonville, Indiana. (*See* SURVEYING AND MAPPING, July-September 1958, Vol. XVIII, No. 3, page 356.)

From Poland

The following, quoted from a special August (1959) issue of the journal of the Polish surveyors, is included in this issue of SURVEYING AND MAPPING as a message from a group of surveyors whose history goes back approximately five centuries, and because it contains a number of bits of information which should be of widespread interest to our readers. Reference: *Przeglad Geodezyjny,* 1959 Nr 8–9, Rok XXXI.

—EDITOR

Though Poland has been for 33 years a member of the International Federation of Surveyors it is for the first time that the meeting of this association takes place in our country.

We take this opportunity to tell our visitors and friends as much as we can about the Polish surveyors and the development of surveying in Poland.

Mutual intercommunication brings understanding and friendship and helps in friendly co-existence of nations. For the last 15 years the Polish surveyors have worked at removing the traces of war, at town and country planning, industrialization and modernization of agriculture. They saw all the misery caused by the war. That is why they support the idea of peace, friendship, and cooperation of nations.

The August issue of *"Przeglad Geodezyjny,"* the journal of the Polish surveyors, is a special copy. It aims at showing:

—that the surveyors of the world have great tasks to achieve

—that general progress opens new vistas for surveying

—that Polish surveyors take part in the most modern surveying work as: observation of artificial satellites, use of electronics in calculation, scientific research connected with the Geophysical Year, etc.

Apart from the professional side, connected with general progress, we want to show our guests some of our country—the geographical center of our professional work and the population we serve.

We would like our visitors to know better the country and the nation which gave to the world Curie-Sklodowska, Chopin, and Copernicus.

We would also like to show the surveyors of other countries the long tradition of our profession in Poland and its historical importance.

In the XVI century Polish surveyors planned, organized, and accomplished the greatest agricultural reform in Europe—the so-called "wloka measure." It was done on a surface of more than 1,000,000 km². In the same period systematical measurements were made in the salt mines at Wieliczka.

The first books on surveying, printed in Polish, appeared in the XVI century and the first scientific department of surveying was opened in the XVII century at one of the oldest universities of the world—the University in Cracow.

Throughout all the ages surveyors have been strictly connected with the land and its people, working for peace, social and economic progress.

Let those ideas, common to all the surveyors of the world, develop and flourish through mutual understanding and friendship.

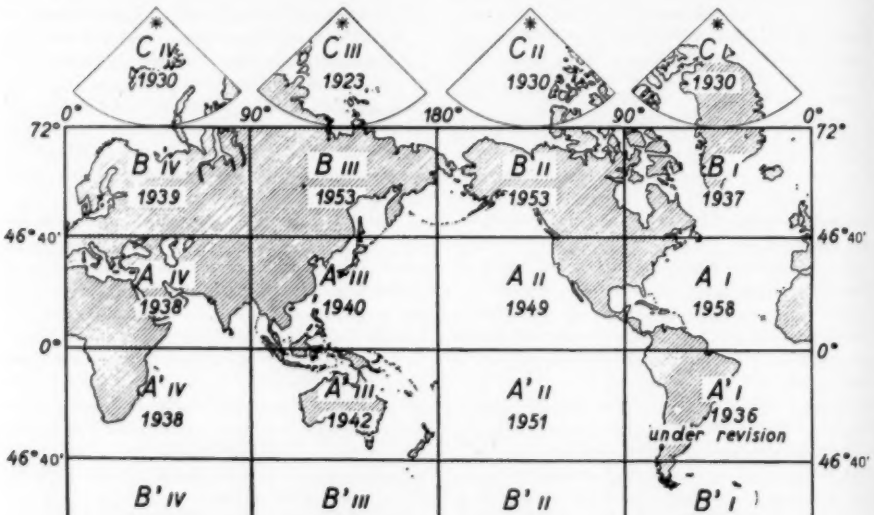
International Hydrographic Bureau General Bathymetric Chart of the Oceans

The Fourth Edition of sheet A-1, North Atlantic Ocean, of the General Bathymetric Chart of the Oceans has been issued by the International Hydrographic Bureau. This is the first sheet of the Fourth Edition, on which work was started in May 1955.

The new sheet was printed in 1959 by the Institut Geographique National in Paris. The magnitude of the task of revising sheets of this world-wide series of charts is revealed by the 47,485 new soundings that were processed and transferred to plotting sheets for just this one component of the 24-sheet series providing world coverage. Latest editions of pertinent charts published by various hydrographic offices were used in the recompilation. The final printed edition contains 6,749 soundings.

The entire mainland coasts and islands were completely redrawn for the Fourth Edition from the most recent nautical charts available. Contours and hypsometric tints were completely recompiled by the French National Geographic Institute. The General Bathymetric Chart of the Oceans is at the scale of 1 : 10,000,000 at the Equator. Sheet sizes measure about 45 by 30 inches. Bathymetry on sheet A-1 is portrayed by twelve gradient tints of blue. Landforms are shown by eight tints of brown.

This series of world charts has a long and illustrious history in the field of world charting. The First Edition was published in 1903–4 pursuant to a recommendation by the VIIth International Geographical Congress held at Berlin in 1899. The first Prince Albert of Monaco undertook the preparation of this chart in accordance with a plan approved by a committee of ten geographers which met at Wiesbaden in April 1903.



Sketch map showing sheet-layout system for the International Hydrographic Bureau General Bathymetric Chart of the Oceans.

(Continued on page 120.)

Books in Review

STRUCTURAL METHODS FOR THE EXPLORATION GEOLOGIST. Peter C. Badgley, *Harper & Brothers,* New York, 1959. 8½ × 11, processed, illustrated, 281 pages. $7.50.

This heavily-illustrated book describes the broad range of current methods and techniques that are being used to solve structural geology problems and to outline ore deposits both in igneous and sedimentary environments. Even though the subject matter is esoteric the book will be readily appreciated by the allied disciplines because of the easy style and graphic approach of the author. This excellent textbook and reference work treats of specific rather than hypothetical problems. Each chapter, largely independent of every other one, begins with a review of principles and is followed by case histories that demonstrate the particular usefulness of a given method. Especial emphasis is placed on the need for selecting that method or interpretative technique which is most in accord with local conditions. Extensive sample problems are provided for laboratory or practical exercises.

The simpler considerations are involved with reducing apparent strike and dip to true values. The construction of geological cross sections, isopach and isochore maps, and ore reserve estimations are some of the more advanced topics treated. Isometric and stereographic solutions are given for several types of ore reserve estimations as well as general structural problems. The final chapter, "Tectonic Analysis of Mining and Petroleum Districts as an Exploration Tool" gives the over-all approach for studying integrated structural units and the possible results to be gained from knowing the dynamic, three-dimensional character of an area. This broad treatment is being used more and more by geologists, and it is felt that this method that makes use of lineaments, secondary faulting, igneous activity, seismic activity and present physiography gives the desired answers in a manner that is readily digestible for the nonexpert. The volume, of obvious value to the worker in the field of structural geology, should prove to be of interest to the mapmaker of limited geological training.

J. N. JORDAN

AERIAL PHOTO-INTERPRETATION OF LANDFORMS AND RURAL CULTURAL FEATURES IN GLACIATED AND COASTAL REGIONS. Northwestern University Studies in Geography, Number 3. William E. Powers and Clyde F. Kohn. *Northwestern University Press.* 111 pages. $3.75.

This publication is an answer in its special fields to the increasing clamor for more research and basic data on the subjects of cultural and geological photointerpretation. This work covers land forms related to glaciation, selected farm crops, rural and seaside resort settlements, and a geographic or "associative" method of photographic analysis.

The dichotomous type of key is used in the presentation of the information and the illustrations are well keyed to the text. Stereo-pairs of photographs are used throughout in vertical and terrestrial views. The illustrations are comprehensive but show evidence of a common weakness in several places, wherein the quality of the terrestrial photography (apparently taken by the authors) exceeds the quality of the aerial photography which probably was selected from available files. Several private and government organizations using the newer distortion-free high resolution lenses on their cameras have available much improved photographs of basic interpretation features. Perhaps the recently established Air Photo Repository at the University of Illinois can make this improved photography available for future publications on photo interpretation.

C. E. COOK

A TREATISE ON THE LAW OF SURVEYING AND BOUNDARIES. Frank Emerson Clark—third edition by John S. Grimes. *Bobbs-Merrill Company, Inc.,* Indianapolis, 1959. 1031 pages. $12.50.

Many property surveyors throughout the nation have been familiar with the previous two editions of Clark's *Surveying and Boundaries.* The third edition has been greatly revised with a considerable amount of new material introduced throughout the book.

Mr. Grimes has reviewed many recent court

decisions and statutes before writing the revision and has improved the content considerably. The footnote references to the many court cases are omitted in the third edition with only selected pertinent decisions cited.

The book is intended to serve as a reference for surveyors and attorneys. It embraces none of the elements of geometrical surveying as it is concerned almost entirely with legal principles. The expanded table of contents and the extensive index enable the reader to refer to nearly any point of surveying law. The book is not well suited for classroom use as there is a lack of continuity and a considerable amount of repetition of principles. Mr. Grimes has added some historical background and a treatment of interests in land helping to balance the book somewhat.

Some subjects are treated in great detail. There are 172 pages devoted to Riparian Rights and related topics as well as 161 pages on the U. S. Rectangular Surveys, to cite two examples. A chapter on the Rectangular System in Canada is included which, though brief, serves to outline the general pattern of surveys employed in western Canada. The chapter on Coordinate Surveying is considerably outdated with very little change from the 1939 edition. For this reason, the material in this chapter will be misleading to all but the well-informed surveyors.

There is probably no other single work that can serve as well as a reference as this third edition does. Property surveyors, title officers, and property attorneys will derive considerable value by adding this book to their libraries.

WINFIELD H. ELDRIDGE

HISTORICAL ATLAS AND GAZETTEER—A STUDY OF HISTORY—VOLUME XI. Arnold J. Toynbee and Edward D. Myers. *Oxford University Press*, London, 1959. x + 257 pages. $12.50.

The volume contains 100 maps illustrating the historical progression of world civilizations and religions. These maps display at a glance geographical features that would require many pages to describe effectively. They provide an excellent geographical guide to the massive ten-volume *Study of History* by Professor Toynbee. This unique collection of special-purpose maps is an impressive demonstration of the importance of maps to intelligent comprehension of historical text. The great historical work that they support is made more real and can be better understood by use of the map supplements. Volume XI is in three parts: (1) A Gazetteer to all place-names mentioned in Volumes I to X and in the Appendix to the present volume; (2) the Atlas of Maps covering the subject matter of the basic volumes and also many names of places not mentioned in the text; and (3) an index to the place names in the Atlas. Explanatory notes in the Gazetteer clear up some obscurities and ambiguities in the geographical names mentioned in the text. Although the Atlas is designed primarily as a companion to the basic volumes, it is arranged to serve also as an independent reference source. Among the several noted cartographers and geographers who contributed advice and suggestions to Volume XI is the late Dr. Samuel W. Boggs, who during his lifetime was one of the illustrious members of the American Congress on Surveying and Mapping.

A. A. STANLEY
Coast and Geodetic Survey

PROCEEDINGS OF THE ILLINOIS LAND SURVEYORS CONFERENCE, March 10–11–12, 1958, held at University of Illinois at Urbana. Published in cooperation with the Division of University Extension under the sponsorship of the Department of Civil Engineering, the Illinois Society of Professional Engineers, and the Society of Professional Land Surveyors. Paper cover, 168 pages, 8½ by 11 inches, photolithographed. *University of Illinois Extension Division*, Urbana, Illinois.

The 1958 conference was the first conference for Illinois Land Surveyors in modern times, being the first in the State in the last ten years. Abraham Lincoln was at one of their earlier conferences back in 1857. Some 40 pages of drawings, diagrams, and forms illustrate the 154 pages of proceedings papers which are listed below:

Platting and Planning Regulations by State, County and Municipalities.
Subdivisions and Land Planning
Easement Planning for Utility Services.
Utility Easement Guide.
Wage and Hour Regulations.
Panel on Standards for Surveys.
Panel on Land Surveyors Registration Laws.
Variations of Surveying Sections as Originally Established by the U. S. General Land Office.
Legal Problems of the Surveyor.
The Surveyor as an Expert Witness.
Panel on Statewide Surveyors Association.
Some Applications of Photogrammetry to Land Surveying.

The Education Problems of Land Surveyors.

Surveying Methods, Preparation and Filing of Right of Way Plats in Illinois.

An additional 14 pages contain contents, program, and conference roster.

The history of attempts to organize the professional surveyors of Illinois, which began back in the early 1800's, is well brought out in a panel paper.

WALTER S. DIX

ROUTE SURVEYS AND DESIGN. Thomas F. Hickerson. *McGraw-Hill Book Company,* 1959, 568 pages. $8.50.

This book is a revision of an older text by the author and publishers, which formerly appeared under the title of "Route Location and Surveying." It has been revised to agree with current design specifications, and an entirely new chapter (10) on electronic computers has been added. This chapter accompanied by material on aerial photogrammetry and earthwork points out modern trends in highway engineering analysis and design.

Supplementing the technical chapters on simple, compound, spiral, and parabolic curves, usually found in route surveying texts, are descriptive chapters on transportation systems, drainage and construction surveys, earthwork, and railroads. In the back of the book the author has placed: an appendix which contains selected derivations, a section devoted to explanation of tables, and a multitude of tables (44) which help solve routine problems encountered by highway office and field engineers.

The text is crammed full of material on a variety of surveying topics and should prove extremely useful for experienced personnel, but the beginner or student may find difficulty acquainting himself with such minor topics as the four-centered compound curve with five spirals or the determination of true bearings by use of the celestial sphere.

ROBERT J. SCHULTZ

SURVEYING. Bouchard and Moffitt. *International Textbook Company,* 1959, 6×9, 664 pages. $10.50.

Professor Moffitt's revision of this well-known text was undertaken to make it current with new practices in the field of surveying. However, he has gone further and has rearranged the sequence of the topics presented. His arrangement is, in my opinion, quite logical from the point of view both of the teacher who wishes to use the book as a textbook and the surveyor or engineer who might wish to use it as a reference or handbook. Examples of his arrangement are the presentation of basic definitions in the introduction, the placing of the chapter on the stadia method just before topographic surveys, and the placing of the adjustment of instruments in a single chapter near the end of the text. The illustrations, examples, and problems are numerous and useful, and a number of new ones have been introduced to demonstrate new methods.

The scope of this edition has been enlarged, probably in line with the present greater awareness of the importance of surveying in a civil engineering curriculum. To quote from the publisher's abstract: "The coverage of special surveying topics has been enlarged and broadened. For example, a chapter which covers the basic principles of photogrammetry has been added. Also, the use of accurate design topographic maps for determining earthwork quantities has been fully explained." The revision is thorough, nevertheless much of the original text written in Professor Bouchard's concise style is retained or very slightly changed.

Some of the new subjects introduced are the subtense bar, the Geodimeter, and the Tellurometer. Also added are illustrations of modern European types of surveying instruments, descriptions of the coincidence method of viewing the leveling bubble, the self-leveling level, and optical reading angle measuring instruments. The chapters on leveling, triangulation, the State plane coordinate system, etc., are thorough for a book of this kind. The field of mine surveying is not covered.

The book is printed on a good quality paper in clear, legible type. The page size is a good one since the text is too large to be published in a pocket edition, and this large size makes it possible for the forms and illustrations to be more legible.

I believe this is an excellent textbook on the theory and practice of surveying, both for use in the classroom and for the practicing surveyor's library.

CECIL F. ELLINGWOOD

BOOK NOTES

In this section of the "Books in Review" department, we propose to include brief notices of books and other publications, which are not complete enough to be considered as reviews but which are in greater detail than is usually given concerning publications listed in the "Books and Pamphlets" section of the "Surveying and Mapping Literature" department.

—EDITOR

PROCEEDINGS OF THE SIXTH ARIZONA LAND SURVEYORS CONFERENCE as presented at the University of Arizona on April 11, 1959, under the sponsorship of the Civil Engineering Department of the University of Arizona and the Arizona Section of the American Congress on Surveying and Mapping. A publication of the Engineering Experiment Station, The University of Arizona, Tucson, Arizona. Price $2.00. Paper cover, 8½ by 11 inches, lithographed from typewritten copy; 77 pages of papers; 8 pages of title, contents, program, speakers, foreword, and welcome; 4 pages of attendance roster.

Papers include: A Method of Computing Charges for Land Surveys; Photogrammetry in the Arizona Highway Department; Triangulation; Boundary Surveys; Solar Observations for Determining the Bearing of a Line, How Good Are They?; Views of a Surveying Consultant; Panel on Monumentation—Monumentation, Monumentation and Identification of Corners From the Title Insurance Company Viewpoint, Monumentation, Monumentation; Panel on Electronic Computers in Use*—Glen Canyon Spillway Tunnel, Cut and Fill, Subdivisions.

WALTER S. DIX

* Papers introductory to Laboratory Demonstration.

PROCEEDINGS OF THE THIRD ANNUAL SURVEYING AND MAPPING CONFERENCE [held at the University of Utah, December 11–12, 1958, under the sponsorship of the Utah Chapter of the American Public Works Association and the Civil Engineering Department, University of Utah] compiled and edited by Clifford G. Bryner, Bulletin of the University of Utah, Vol. 50, No. 13, April 1959, and also Bulletin No. 97 of the Utah Engineering Experiment Station, Department of Civil Engineering. Paper cover, size 8¼ by 10¾ inches, processed, 62 pages of papers and 5 pages of title, foreword, contents, and attendance roster. No price indicated.

This publication contains the following papers:

"One Common Goal," by H. P. Lee,

"When Neighbors Have Boundary Line Troubles," by Brigadier General Franklin Riter (Retired),

"Title Insurance vs. Abstracts," by Robert L. Backman,

"Property Surveys, What is the Problem?," by J. Dean Hill,

"Accuracy & Economy in Surveying," by Charles V. King,

"The Practical Use of the State Coordinate System," by Robert L. Howland,

"Trends in Surveying and Mapping for Highway Design," by O. D. Miles,

"Application of Aerial Photography to Soil Classification," by O. C. Olson, and

"Reproductions," by Clyde Condley.

—HOWARD S. RAPPLEYE

MATHEMATICAL BASIS OF ANALYTIC AEROTRIANGULATION, by G. C. Tewinkle. Coast and Geodetic Survey Technical Bulletin No. 8, August 1959. Available from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. Price 15 cents. Paper cover, size 7⅞ by 10¼ inches, 9 pages, illustrated with diagrams.

Technical Bulletin No. 8 presents the mathematical basis of the solution of analytic aerotriangulation that is currently being programmed for electronic computation in the Coast and Geodetic Survey.

HOWARD S. RAPPLEYE

EPHEMERIS OF THE SUN, POLARIS AND OTHER SELECTED STARS WITH COMPANION DATA AND TABLES FOR THE YEAR 1960, Prepared by the Nautical Almanac Office, United States Naval Observatory and published by the Bureau of Land Management, Department of the Interior, is the fifty-first edition of this annual supplement to the Manual of Instruction for the Survey of the Public Lands of the United States.

This useful 32-page publication, familiar to most surveyors, is available from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., for 30 cents per copy.

HOWARD S. RAPPLEYE

Abstracts of Articles on Geodesy and Related Fields

The Army Map Service, of the Corps of Engineers, U. S. Army, publishes quarterly a series of processed sheets under the title: "Abstracts of Articles on Geodesy and Related Fields." The following are excerpts from the issue bearing the date of October 1959 and are selected for reprinting in SURVEYING AND MAPPING as being of possible interest to a considerable percentage of our readers. The selection has been somewhat arbitrary, and only those abstracts believed to be of quite general interest have been included. —EDITOR

564 *An Iterative Procedure for Computation of Long Geodesics* (Ein Iterationsverfahren zur Berechnung langer geodaetischer Strecken). Karl Hubeny

It is shown how inverse computation can be carried out over rather long geodesics by a rapidly convergent iterative procedure with formulae of short range.

On an ellipsoid of rotation, we shall not only compute the geodesics between two given points P_1 (ϕ_1, λ_1) and P_2 (ϕ_2, λ_2) but also the azimuths α_1 and α_2 at its initial and end points respectively. The Gauss mean latitude formulae for a certain range $\Delta\phi_0$ and $\Delta\lambda_0$ are assumed as given.

We carry out the iteration by forming the sequence of intermediate points $Q_1 \ldots Q_{k-1}$ according to

$$\begin{aligned}
\phi_{Q,1} &= \phi_1 + \Delta\phi_{12} \div k \\
\phi_{Q,2} &= \phi_1 + 2\Delta\phi_{12} \div k \\
\phi_{Q,\,k-1} &= \phi_1 + (k-1)\Delta\phi_{12} \div k \\
\lambda_{Q,\,1} &= \lambda_1 + \Delta\lambda_{12} \div k \\
\lambda_{Q,2} &= \lambda_1 + 2\Delta\lambda_{12} \div k \\
\lambda_{Q,\,k-1} &= \lambda_1 + (k-1)\Delta\lambda_{12} \div k
\end{aligned} \qquad (1)$$

between the given points P_1 and P_2 and solving the inverse computation between each pair of points P_1Q_1, $Q_1Q_2 \ldots Q_{k-1}$, P_2. We thereby develop a polygon $P_1Q_1 \ldots Q_{k-1}P_2$ formed by geodesics and compute the partial lines $Q_1Q_{10} = a_1$, $Q_2Q_{20} = a_2$ etc. which, in the first approximation, are equal to the lengths of arc Q_1Q_{10} of the parallels between the geodesic P_1P_2 and the points Q_1.

From the quantities

$$d\lambda_1 = \frac{a_1}{P_1},\ d\lambda_2 = \frac{a_2}{P_2},\ \ldots,\ d\lambda_{k-1}\ \frac{a_{k-1}}{P_{k-1}} \qquad (2)$$

increments $d\lambda_1 \ldots d\lambda_{k-1}$ are computed which, applied to the longitude of the corresponding points, yield a new sequence of points Q_1–Q_{k-1} approaching the geodesic P_1P_2 more closely. A repetition of this process yields a polygon whose sum of sides largely approaches the length of the geodesic P_1P_2. The azimuths α_1 and α_2 at the points P_1 and P_2 are determined in good approximation by unfolding on the plane the last iterative step, i.e. by applying increments ψ_1 and ψ_2 to the azimuths of the lines P_1Q_1 and P_2Q_{k-1}.

There follows a study of how far the approximation must be carried out if the difference $[s_1] - s$ is not to exceed a value Δs suggested by the accuracy desired. An estimate calculation shows that in the case of $s = 1000$ km, $k = 8$ and $\Delta s = 0.001$ m we may permit a Δa_0 of approximately ± 5.6 m for each partial distance.

If we wish to compute the angles ψ_1 and ψ_2 by unfolding the line path $P_1Q_2 \ldots\ldots Q_{k-1}$ P_2P_1 on the plane, spheroidal excess of the figure would have to be negligible.

It is also discussed under which assumptions, i.e. with which degree of approximation the figure formed by the polygon $P_1Q_1 \ldots\ldots Q_{k-1}$ P_2P_1 can still be computed in the plane also with regard to the azimuths. About a sixth of the excess is neglected in the azimuths if we do without the correction $d\psi$, i.e., compute the figure on the plane.

The spheroidal excess is computed from $\varepsilon = J \cdot K$, where J means the surface of the polygon and K a mean value of the curvature $\left(K = \frac{1}{MN} = \frac{1}{R^2}\right)$. If we wish to attain a definite accuracy in the azimuths, e.g., below the limit value $\Delta\alpha$, we must have $\frac{1}{6} J K \leqq \Delta\alpha$.

The computing effort can be reduced if we do not begin the computation with the point sequence $Q_1 \ldots\ldots Q_{k-1}$ given from (1) but correct the longitudes of these points so that

this point sequence better fits the geodesic at the outset.

In conclusion, a practical example is given from Jordan's *Handbuch der Vermessungskunde.*

Oesterreichische Zeitschrift fuer Vermessungswesen (German) AMS-GL-B661. 7000, Vol. 47, No. 1 (1959)-mc

567 *Solution of the Forward and Inverse Computations for Long Lines* (Loesung der geodaetischen Hauptaufgaben fuer grosse Entfernungen). Miloš Cimbalnik

It is believed that the arc of normal section can be represented quicker by means of electromagnetic waves, after proper reductions, than by the geodetic line. The following solution is suggested:

By means of a trihedron, constructed at the initial point of the normal section, an auxiliary coordinate system (x, y, z) is obtained. These coordinates are used to establish an equation for the ellipsoid in rotation, and then by setting $z=0$ the equation of the curve of the normal section is obtained. That is an ellipse equation whose semi-axis can be computed by its transformation into the central system. Basically, the next steps represent the solution of the "determination of the arc of meridian" (forward computation), or the inverse computation problem in which the dimensions of the ellipse differ in each case.

For the solution of the forward computation certain relations were transferred, while for the inverse computation new formulae were derived and introduced. In both cases series are derived in such a manner that their coefficients appear as the functions of the numerical eccentricity of the ellipse of the normal section. For these coefficients tables are presented. With increasing distance the accuracy of 1–2mm. per 1000 km. is slowly reduced.

Studia Geophysica et Geodaetica (German) AMS-GL-B662.7400, Vol. 1, No. 1 (1957)-ma/ms

568 *The Problem of Transformation of a Reference Ellipsoid to Another by Means of Projecting Along the Normal* (Ueber das Problem der Transformation eines Referenzellipsoids auf ein anderes mittels Projektion laengs der Normalen). Miloš Pick

This problem was treated by a number of prominent geodesists but always under the condition that the z axes of both surfaces are parallel. Since this condition need not always be fulfilled, equations for a more general case are derived by twisting the second system and by using the Euler angles (υ, ψ, τ; where τ represents rotation). The following two considerations are being made: $\upsilon < 20''$ as favorable, and the intersection of the x and X areas with the equator as the origin. For suitable selection of the position of the x and X axes it is arranged that $\psi < 20''$, $\tau < 20''$.

After setting the relations for the points of the first and second ellipsoids and for the distance $\overline{PP'}$ into the equation for the second reference surface, a quadratic equation for h (h corresponds to the distance $\overline{PP'}$) is obtained. When the accuracy of ± 0.1 mm. for h is acceptable, the equation is solved by an approximation method (5).

If the values of h are derived in the directions of the meridian and of the parallel of the first ellipsoid, the changes in the deflections of the vertical are obtained. After corresponding rearrangement (7) and computation of these changes the angles α and $(90^\circ - \beta)$ are obtained (8). Since there is a negligible difference between these two angles,

$$\alpha = [-\Delta\lambda + (\psi + \tau) + \upsilon\cos\lambda\operatorname{cotg}\phi]\sin\phi \qquad (10)$$

For the computation of the geodetic coordinates of the second ellipsoid the equations (11) are presented. On such a basis the relations are derived (12 and 13) and instead of h the approximate expression (14) is derived. If now the Euler angles υ, ψ, τ are set as equal to zero in the equations (5), (7), and (8), the simplified relations as derived in (5) are obtained.

Practical examples for each of the two problems of transformation of a reference ellipsoid to another one are presented.

Studia Geophysica et Geodaetica (German) AMS-GL-B662.7400, Vol. 1, No. 2 (1957)-ma/ms

569 *Use of the Projection of a Surface of Rotation onto a Sphere for the Transfer of Coordinates when the Distances Between Points Are Fairly Large* (Anwendung der Abbildung einer Rotationsflaeche auf eine Kugel fuer die Uebertragung von Koordinaten bei groesseren Entfernungen zwischen den Punkten). Jan Kašpar

The procedure is briefly discussed for deriving the equations for the parameters of the image of an area curve in a general projection of the area onto another, on the premise that the geodetic curvature of the original line is known as function of its length. In this manner, we determine polar as well as rectangular semigeodetic coordinates of any point with regard to a geodesic connecting the end points of the

image of the curve. Formulae for the corrections to the direction and length were derived using the developments in the center of the geodetic base line.

Furthermore, the conformal projection of a surface of rotation onto a sphere is derived which produces the smallest length ratio in the vicinity of the given parallel. In this projection, we determine the corrections in direction and length for the image of a geodesic originating from a common point. These values are then used for the exact transformation of the polar coordinates to geographics and inverse. By means of suitable transformations, the corrections introduced are reduced and the constants therein contained are transformed in toto into functions of the Gauss value for the curvature of the surface of rotation and the geodetic curvature of the parallel which, according to their nature, are independent of the selection of a curvilinear coordinate system on the area.

In practice, we use this in the transfer of coordinates on a flattened ellipsoid of rotation (i.e., in the solution of geodetic problems). Here we use the Gauss conformal projection of an ellipsoid with undistorted fundamental parallel; this corresponds to the above-mentioned projection of a surface of rotation. Of advantage will be a solution where the initial point of the geodesic is located on the fundamental parallel; we also prepared a detailed computation for this case; this computation can be accelerated by arranging a few projection constants in tabular form.

STUDIA GEOPHYSICA ET GEODAETICA (German) AMS-GL-B662.7400, Vol. 1 No. 2 (1957)-ms

570 *A Characteristic Property of Spherical or Plane Surfaces* (Une propriété caractéristique des faisceaux de surfaces sphériques ou planes). M. Lucien Vantroys

The following new theorem is presented: In order that the projection of one surface onto another—within a family of surfaces with the same parameter—by means of their orthogonal trajectories may define a conformal projection, the condition that these surfaces be spherical or plane is necessary and sufficient.

A detailed mathematical study is presented as a proof that the condition is both necessary and sufficient. There was previously no proof that the condition is necessary, although G. Darboux, in 1910, had proved mathematically that the condition is sufficient.

From the geodetic and cartographic points of view it was concluded that the definition of a plane conformal projection of the geoid can be transposed to other level surfaces of the earth's gravitational field by projection along the verticals and thereby remain rigorously conformal.

COMPTES RENDUS ACADEMIE SCIENCE FRANÇAISE (French) AMS-GL910.1112, Vol. 247 No. 1 (1958)-ma/ms

571 *The Dimensions of the Earth Ellipsoid from the European Astronomic-geodetic Nets* (Die Ausmasse des Erdellipsoids aus den europaeischen astronomisch-geodaetischen Netzen). M. Burša

Since there are enough astronomic-geodetic data available in Europe to determine the dimensions and orientation of the reference ellipsoid on a scientific basis, the Geodetic Research Institute in Prague has solved this problem by means of two methods: the translative and the projective. A total of 708 astronomic-geodetic points was used, collected from 21 countries.

For the translative method, the equations for the arc measurements were used in their usual form, but the differential coefficients were transformed in such a manner that they are functions of the geodetic coordinates only. For the projective method, the equations for the arc measurements were used in the form developed by Izotov; the translative or mixed deflections of the vertical were transformed into the system of the projective deflections of the vertical. Both methods are discussed and analyzed.

The results show good agreement in the semi major-axis derived according to the two methods. The difference as compared to Bessel's value is about +750 m, and as compared to Hayford's about −200 to −250 m.

The final values obtained are:

(a) for a flattening of 1:298.3

$a = 6{,}378{,}161$ m. $\xi_0 = +4.86''$ $\eta_0 = +1.48''$

(b) for a flattening of 1:297.0

$a = 6{,}378{,}154$ m. $\xi_0 = +4.76''$ $\eta_0 = +1.40''$

The author concludes his article with the claim that the above results prove again that the Krasovskiy ellipsoid is the most suitable figure.

VERMESSUNGSTECHNIK (German) AMS-GL-B664.7350, Vol. 7, No. 4 (1959)-ms

573 *Temperature Determinations in Base Line Measurements with Invar Wires* (Temperaturmessungen bei Basismessungen mit Invardraehten). W. Kluge

The value of the correction for temperature to be applied to the length of the wires is gen-

erally determined by determining the temperature of the air with a sling thermometer. Since 1954, a rod thermometer graduated to 0.2° is used in the GDR. During the measurement of a base line on the Island of Ruegen and check measurements at the check base line in Potsdam during September 1956, it was shown that more accurate temperatures are obtained under all atmospheric conditions when using the rod thermometer. A special Soviet instrument was used to determine the difference between wire and air temperature. The author then describes their procedure for determining how great the change in the length of the wires is due to correction for temperature. The author gives the equation for the temperature correction to be applied to the measurement wires and then derives the influence of the temperature on the wires. It is important in all measurements that two wires are used, one with a positive and the other with a negative coefficient of expansion of the same magnitude. The best results in base line measurements will be obtained when the base line is established in open country.

VERMESSUNGSTECHNIK (German) AMS-GL-B664.7350 Vol. 6, No. 5 (1958)-ms

574 *On the Adjustment of Continental Triangulation Nets* (A kontinentalis halozatok kiegyenliteserol). A. Tarczy-Hornoch.

Dealing with the practical problem concerning the adjustment of continental nets and referring to his own previous publications and those by Hazay, the author recognizes the convenience that, by imposition of conditional *side* equations, the lengths of computed sides are introduced into the fictitious first-order net by means of small triangles according to the procedure suggested by Kochmanski and Baltkiewicz. The latter have however overlooked the circumstance that the derived sides are not reciprocally independent.

Taking this fact into account, the author supposes that for each of the large triangles (sides from 150 to 200 kilometers) a *base* has been measured near the relative center of balance.

From the six elements of each large triangle (i.e. from three sides and three angles) obtained by its separate adjustment, we can therefore derive new, more precise values, further corrected by means of the global adjustment of the entire system of large triangles; in this adjustment, the above elements are considered as independent observations. If the system under consideration consists of n points, we shall have $(n-1)$ triangles, each with 6 fictitious observations.

Since for the reciprocal determination of the first two vertices one length is needed, whereas for each of the others two angle observations are necessary, it is easy to see that there are $4n-3$ or 25 excessive observations for a hexagon with a central point (6 for the sums of the angles of the triangles, one for the closure of the horizon at the central point, 6 for the equality of the lengths of each side common to two adjacent triangles, 12 for the equality between the known value of a single side of a triangle and the two values derived for it from the other two sides).

This conspicuous complex of condition equations, to which can be added those derived from the astronomic determination of the position of some vertices, permits an adequate adjustment.

If the provisional coordinates of the seven vertices constituting the hexagon with the central point are known in a suitable system of projection, we can easily compute the values of the sides and angles of each of the triangles; setting these values equal to those computed with the large triangles, we will have 36 equations (of which there is an excess) which contain 11 non-measured unknowns and from which 11 normal equations are derived.

GEODEZIA ES KARTOGRAFIA (Hungarian) AMS-GL-B661.7200, Vol. 10, No. 4 (1958)-af

575 *The National Gravimetric Baseline "Bologna-Ferrara" and the Time Variation of the Calibration Factor of the Worden Gravimeters* (Sulla base gravimetrica nazionale "Bologna-Ferrara" e sulla variazione nel tempo del fattore strumentale dei gravimetri Worden) C. Gantar and C. Morelli

The results of a new interpolation of the relative gravity values for the Italian National Gravimetric Base-line from Bologna to Ferrara (161.06 mgal) are presented.

In addition, the gravity differences were measured from Bologna to S. Luca (mgal $+43.50_8 \pm 0.00_8$) and from Ferrara to Rovige (mgal $+42.47_8 \pm 0.00_5$) and Padova (mgal $+12.79_4 \pm 0.01_1$) and a precise line of 259.84 mgal was thus obtained. Besides serving as a check for geodetic purposes, this line is very convenient for the calibration of desensitized wide-range gravimeters.

Pending a world standard gravity determination, the computation is expressed in Italian conventional milligal.

A comparison of calibration factors of the Worden gravimeters at various times yields a decrease in the scale factor of approximately 1.2 0/00 per year, where the effect of temperature has been taken into account.

Bollettino di Geofisica Teorica ed Applicata (Italian) AMS-GL-B641.5500 Vol. 1, No. 1 (1959)-mc

576 *Effects of Temperature on the Scale Factor of Worden Gravimeters* (Effetti di temperatura sul fattore di scala dei gravimetri Worden). C. Gantar and C. Morelli.

In order to check the scale factors of the Worden gravimeters, four of these instruments were tested. For the purposes of the tests, a special container equipped with a thermostat was developed for better insulating the gravimeters against outside temperatures.

The calibration tests were made at the calibration base known as "Trieste No. 2," at external temperatures from 12° to 19° C and internal temperatures in these containers from 33° to 49° C. The results showed that the scale factors increased with the internal temperature. The rate of increase has a mean value of 0.08% for 1° C.

On the basis of these tests, the following precautionary measures are suggested:

1. To use a container equipped with thermostat in connecting surveys "along meridians", also measuring a large field of gravity variations.
2. To give at least due consideration to these tests results in connecting surveys "along parallels" where, however, the variations of g are minor.
3. To make a detailed study of every new Worden gravimeter to be used in geodetic work.

Bollettino di Geofisica Teorica ed Applicata (Italian) AMS-GL-B641.5500, Vol. 1, No. 1 (1959)-ms

578 *Aerophotogrammetric Survey* (Rilevamento Aerofotogrammetrico). Dr. Alfredo Pàroli.

Following a discussion of the principles of photogrammetry, in general, and aerial photogrammetry, in particular, domestic plotting instruments used in making the new maps of the Italian cadastre are classified and described in detail. The most modern are the following:

The Nistri Photocartograph Model V and the Nistri Photomultiplex Model D-III, both automatic, where the various commands are carried out by means of electromagnetic servomotors; the Santoni Stereocartograph with a special device for eliminating automatically the effects of distortion of the photographic lens; and the Santoni Stereo-simplex, the I.R.T.A. Stereosurveyor [stereorilevatore], and the Nistri Photostereograph Model Beta-2 with automation (as above). The Wild, Zeiss, and Poivilliers plotting instruments are mentioned among the foreign instruments used.

The aerophotogrammetric method is being used predominantly for topograhic mapping at medium scale (from 1:25,000 to 1:50,000) and for the extension of some of the large-scale cadastral surveys from 1:1000 to 1:5000). About 8,000 map sheets cover an area of approximately one million hectares surveyed by the above method.

Photograms are usually taken by means of glass plates of adequate thickness in order to exclude deformation; for mountainous areas, film is also used and the diapositives are then printed on glass.

Coordinates and elevations of reference points generally are determined by conventional triangulation and trigonometric leveling procedures, assuming as horizontal control the national general geodetic net and as vertical control the elevations resulting from the precise geometric levelings.

The established tolerances for the acceptance of maps surveyed by classical terrestrial topographic methods are applied when checking maps surveyed by the aerophotogrammetric method. The limits of tolerance are:

$t_1 = 0.05\sqrt{D} + 0.00025\ N$ (for distances up to 200 meters)

$t_2 = 0.04\sqrt{D} + 0.0002\ N$ (for distances above 200 meters)

The tolerable maximum error in elevation is approximately one meter for maps at 1:1000, to two meters for the scale at 1:2,000 and three meters for that at 1:4,000.

Rivista del Catasto e dei Servizi Tecnici Erariali (Italian) AMS-HD671 R62, Vol. 13, No. 2/3 (1958)-mc

580 *Limit of Error, Elimination and Condition of Frequency* (Felgräns, kassation och frekvensvillkor). S. Dahlstrand

Is it possible to increase the accuracy of results in measurements by reducing the limit of error? The answer depends on the type of limit of error, the types of errors and their distribution, and on various prerequisites for frequency of elimination. The limit of error is complemented by a condition of frequency.

In forward and backward measurement the limit of error is adjusted to a variable; thus an indirect check is obtained. A detailed study here presented concerns the case when the limit of error is interpreted as the extent of elimination. The elimination as such provides no correcting effect. Even if the extent of the elimina-

tion is reduced, there is no effect on the accidental errors in the mean value used. In certain cases an adjustment of the limit of error may impair the quality of results. For practical purposes it can be assumed that a mere limit of elimination has either no effect or worsens the distribution of residual errors.

There is no proof that frequency conditions are necessarily a guarantee against errors of an undesirable magnitude. In practice the frequency conditions offer certain possibilities for checking. The limit of errors contains both the extent of eliminations and the basis of frequency conditions. In practice this double function serves as a conventional limit between accidental and gross errors.

A discrepancy in forward and backward measurement can be regarded as a special case of the extent of variations. If an elimination improves the mean value, the frequency of the observed value affords some guarantee as to the frequency of error in the mean value used. The error in the mean value is independent of the extent of variation obtained in the chain of observations. This may correspond to the conditions in angle measurements. Under such conditions the extent of variations as a practical functon must be the criterion for gross errors. No improvement results from narrowing down the limit of elimination unless it be combined with the requirement of the unchanged percentual elimination.

SVENSK LANTÄTERITIDSKRIFT (Swedish) AMS-GL-B686.7200, Vol. 50, No. 4 (1959)-ma

581 *The Elimination of Turns of the Tripod in Observing Sets of Directions* (Zur Eliminierung von Stativdrehungen bei der Satzmessung). Niklaus Wyss

If the directions are observed clockwise in the first position and counter-clockwise in the second position, the constant turning of the tripod is eliminated. At the end of the set the initial direction is often observed a second time. If the differences of the two values attain substantial magnitude, a linear distribution of the difference through all directions of the set is made.

For linear turns of the tripod, no difference can occur between the initial and final readings for the initial direction. Therefore, the usual linear distribution of the difference Δ cannot correspond to a linear turn of the tripod as it is often assumed instinctively. There exists a quadratic distribution of the discrepancy which can be computed on the slide rule as easily as the linear distribution.

On the basis of the newly derived formulae the following results are presented: (1) there is no satisfactory formula for the turn of the tripod as a function of the time which corresponds to the frequently introduced linear distribution of the difference between the means from the observations of the same initial direction at the beginning and end of a set; (2) the simplest assumption for this function, constant angle acceleration, leads to a quadratic distribution of the difference Δ.

The formulae especially derived for continuous turns are applicable in the sense of an approximation. The computation itself of the error, in principle, is not affected by the type of distribution be it without distribution, with linear or with quadratic distribution. Therefore, the different mean errors do not offer a criterion for the selection of the most suitable type of distribution of Δ.

SCHWEIZERISCHE ZEITSCHRIFT FUER VERMESSUNG, KULTURTECHNIK UND PHOTOGRAMMETRIE (German) AMS-GL-B644.7200, Vol. 56, No. 12 (1958)-ms/ma

583 *Present Status and Problems of Research in Engineering Geodesy* (Sovremennoe sostoyanie i zadachi nauchnykh issledovaniy v oblasti inzhenernoy geodezii). Dr. N. G. Viduev

The modern geodetic science consists of the following five major fields: astro-geodesy, carto-geodesy, aerophoto-geodesy, geodetic and photogrammetric instrumentation, and applied geodesy.

At the present time, as it had been in the past, astro-geodesy determines the basic subject-matter of this science.

From the production view point, carto-geodesy is the largest field. It unites in one circle all the problems of modern geodesy, topography, and cartography. The last 30 years are characterized by great changes in methods of topographic surveys. The aerial survey has almost replaced the terrestrial. The new stage of the large-scale mapping in the USSR also represents a further step in the development of the carto-geodetic field. Topographic maps at the scales of 1:10,000, 1:5,000, 1:2,000 and 1:1,000 are now used as topographic base-maps for other projects. The new stage in the Soviet cartography requires research on map compilation and production.

The correct development of Soviet photogrammetry paved the way for successful mapping at small and medium scales. The USSR Academy of Sciences, under the leadership of

N. G. Kell', carried out last year detailed research on large-scale aerial surveys.

The modern trend in mapping has been showing its influence on instrumentation. Modern large-scale mapping requires new and better photogrammetric instruments. Hence, electronic instruments have priority.

In the field of applied geodesy, such as highway, hydrotechnical, urban, architectural, and similar surveys, noticeable progress has been made. The requirement of close relationship between mapping and applied geodesy created a new branch—engineering geodesy. A detailed description of the new branch is presented.

Izvestiya Vysshikh Uchebnykh Zavedeniy, Geodeziya i Aerofotos "yemka (Russian) AMS-GL-B675.2215, No. 5 (1958)-ma

584 *Secondary Education in Topographic-Geodetic Sciences in the USSR* (Postanovka srednego topografo-geodezicheskogo obrazovaniya v SSSR). S. P. Glinskiy

The number of secondary topographic-geodetic schools has been increased since 1924 from two to nine. In addition, there are some departments in other technical schools offering topographic-geodetic courses. About 7000 students are attending these schools. There are two groups of students: those who previously graduated from a nontechnical secondary school have to study two and a half years, and those who completed only seven classes have to study three years and nine months. The yearly increase of enrolled students in topographic schools was as follows: 1927—100%, 1947—700%, 1957—2250%. The following four professional specializations are distinguished in the curriculum: topography, geodesy, aerial photogrammetry, and aerial survey.

Geodeziya i Kartografiya (Russian) AMS-GL-B675.2214, No. 11 (1957)-ma

585 *Progress in Astronomical Operations* (Razvitiye astrometricheskikh rabet). V. V. Podobed

A review is presented concerning the Transactions of the 14th All Union Conference.

According to the plan for the IGY, the astrometrists participated in the determination of latitudes and longitudes. The Soviet Latitude Service has been strengthened in recent years. Powerful zenith telescopes were installed in the Pulkovo, Kazan', and Irkutsk observatories, and in the Astronomical Institute *imeni* P. K. Shternberg. The Soviet Time Service has also been reorganized.

It is recommended that the International Latitude Service be reorganized in both technical and organizational respects.

Kh. I. Potter submitted a report on the first Soviet zenith telescope for the determination of time corrections and of latitudes. Reports of several other prominent Soviet scientists are also mentioned.

Vestnik Akademii Nauk SSSR (Russian) AMS-Q60 Vol. 58, No. 8 (1958)-ma

586 *Astronomical Observations of Artificial Earth Satellites* (Astronomicheskie nablyudeniya iskusstvennykh sputnikov zemlji). A. G. Masevich

Observation and study of the artificial satellite's motion raised many new problems. There is no exact theory of such motion, therefore, it is impossible to predict the satellite's position over extended periods of time. From the moment the first Soviet satellite was launched (in 1957) 70 visual stations were operating in the USSR, over 100 stations of the "Moon Watch" system in the USA, 59 stations in Japan, 18 in the Netherlands, 14 in China, 13 in Czechoslovakia, 10 in Poland, and 8 in East Germany. By 1 January 1959, the computing center of the USSR had received data from more than 42,000 observations of the first, second, and third Soviet satellites.

In the USSR, the AT-1 telescope is used for such observations. To determine the moment of passage with an accuracy exceeding one second, a printing chronograph is used. Experience has shown that the majority of observations determine the position of the satellite with an accuracy of up to one degree, while the moment of passage is given within fractions of a second at the best stations only. The average departure of the observations from the computed orbit was within one or two degrees of the right ascension and declination. There was no possibility of observing in the USSR even one of the first three USA satellites.

Ya. E. Eynasto of Tartu invented an experimental auto-recording theodolite to which a photographic device is attached which takes a picture of the reading of both circles through a microscope. Exact photographic observations are needed to solve problems concerning the shape of the Earth and its atmosphere and other geodetic problems.

To obtain an accuracy of one second of arc for the coordinates, the time reading must be accurate to within 0.002 seconds. Therefore, photographic observations must be made with an astronomical telescope which has a special

provision for exact time measurements. In order to photograph satellites, new instruments as well as modification of the old ones are needed. In the USSR, the NAFA-3c/25 wide-angle aerial camera is used to photograph satellites. The position of a satellite on photographs can be determined with an accuracy of up to one minute of arc. The A. N. Deych and A. A. Kiselev method is predominantly used for determining the satellite position. The method is briefly described. At the Main Astronomic Observatory (Pulkovo) a camera with a moving film was designed which can record satellites weaker than others which can be photographed by ordinary methods. The satellite is photographed on an oscillating plate through a telescope. The direction of the line along which photographic plate oscillates coincides with the direction of the motion of the satellite. The moment of the individual exposure is recorded with an accuracy of within 0.001 sec.

Studying the change in brightness of artificial satellites presents many problems. The Odessa Observatory is carrying out an analysis of the observations concerning the change in brightness.

Vestnik Akademii Nauk (Russian) AMS-Q4 Vol. 57, No. 5 (1959)-ma

588 *A Test of the Accuracy of the Vening-Meinesz Formula for the Determination of the Deflection of the Vertical* (Issledovanie tochnosti formuly Vening-Meinesa dlya uklonenii otvesnykh linii). M. I. Tiron

The Vening-Meinesz formula for the determination of the deflection of the vertical on the physical surface of the Earth was tested on a prismatically shaped model of infinitive range; with the height H, and the angle of inclination α of sides with respect to the plane of the reference surface. The disturbing mass was represented as a flat slab parallel to the reference surface.

No	ξ_t	α in degrees	$h=0$	$\Delta\xi/\xi_t$ (in percentage) $\frac{1}{6} \le \frac{h}{H}$	$\frac{1}{3} \le \frac{h}{H}$	$\frac{1}{2} \le \frac{h}{H}$	$\frac{2}{3} \le \frac{h}{H}$
1	39.31″	25	12.0	10.3	8.6	6.6	4.6
2	36.44	20	8.9	7.6	6.3	4.9	3.3
3	35.33	18	7.6	6.5	5.4	4.1	2.8
4	34.25	16	6.4	5.5	4.5	3.4	2.4
5	33.18	14	5.2	4.4	3.6	2.8	1.9
6	32.14	12	4.1	3.4	2.8	2.1	1.4
7	31.12	10	3.0	2.5	2.1	1.5	1.0
8	30.12	8	2.1	1.7	1.4	1.0	0.7
9	29.14	6	1.2	1.0	0.8	0.6	0.4
10	28.17	4	0.5	0.5	0.4	0.3	0.2
11	27.22	2	0.1	0.1	0.1	0.1	0.0
12	26.76	1	0.0	0.0	0.0	0.0	0.0

In accordance with the Vening-Meinesz formula, the deflection of the vertical was computed at the points where accurate values have maximum values. The table above shows the errors $\Delta\xi$ of the Vening-Meinesz formula. The errors appear approximately proportional to the square of the angle α. The maximum anomaly of all cases equals 250 mgal. The prism base equals 30.02 km.

The differences between the accurate values of the deflection of the vertical on the geoid and the values obtained by the Vening-Meinesz formula in all cases are rather great. Such differences depend upon α and h/H, and they vary from $+26''$ to $-28''$.

Geodeziya i Kartografiya (Russian) AMS-GL-B675-.2214, No. 11 (1958)-ma

590 *On the Construction and the Principles of Adjusting National Control Nets* (O postroenii i printsipakh uravnivaniya gosudarstvennykh geodezicheskikh setei). A. I. Durnev

The following are the principles of constructing geodetic nets: (1) all operations should be carried out with the highest degree of accuracy obtainable by the most modern instruments; (2) the construction of the main control net should be carried out in accordance with the principle from smaller but accurate toward larger and more accurate; (3) a multi-stage construction of geodetic nets is not expedient.

The following are the principles of the adjustment of control nets: (1) The first-order continuous net is divided into blocks, each block (200 by 200 km.), consisting of about 400 points, is rigorously adjusted as a semi-free net based upon base lines and Laplace azimuths, and independent from adjoining blocks; (2) such blocks are then adjusted by means of the Pranis-Pranevich method; (3) in each of these blocks coordinates of points are computed by selecting one point as the initial point, but in all the blocks the corresponding initial points must have corresponding positions; i.e., if in the first block the point in the center was selected as the initial point, then in all other blocks center points will serve as initial points; thus, a large area of groups of blocks is formed; (4) all blocks of a net can be adjusted in the following computing manner: (a) the length of the sides and azimuths of large areas are computed on a spheroid and all angles of large areas are computed on the basis of the differ-

ence in azimuths; (b) the increase in the coordinates is computed—in the system of spheroidal coordinates—between the points of large areas directly measured.

In order to cover the entire territory of the USSR about 2000 large areas will be needed.

Izvestiya Visshikh Uchebnykh Zavedeniy–Geodeziya i Aerofotos'emka (Russian) AMS-GL-B675.2215, No. 5, (1958)-ma

591 *High Precision TVO-1 Optical Theodolite* (Vysokotochnyi opticheskii teodolit TVO-1). E. T. Zdobnikov

The Soviet TT2/6 theodolite has been used for a long time as a satisfactory first-order instrument. Now a new, more precise and lighter first-order instrument, the TVO-1 optical theodolite, is replacing the TT2/6 theodolite. The new instrument was designed in 1957, and thoroughly tested during the summer and fall of 1958. The test showed that the mean square error of angle measurement does not exceed $\pm 0.7''$–$0.9''$.

The following technical data of the new theodolite are of interest: glass circles are graduated from 0° to 360°; the diameter of the horizontal circle 160 mm.; the diameter of the vertical circle 100 mm.; the drum of the optical micrometer is graduated to 1 second; the clear aperture of the object glass is 36 mm.; magnifications of telescope 62.5, 50, and 37 times.

A detailed description of the latest design of this Soviet optical theodolite is presented.

Geodeziya i Kartografiya (Russian) AMS-GL-B675.2214, No. 2 (1959)-ma

₹ ₹ ₹

Professional or Nonprofessional

The following excerpts from "Attributes of a Profession," by Ernest Greenwood, Ph. D., Associate Professor of Social Welfare, University of California, originally published in the July 1957 issue of *Social Work*, the journal of the National Association of Social Workers, have been reprinted from *The Canadian Surveyor*, August 1959, Vol. 14, No. 9, page 434. —Editor

It is often contended that the chief difference between a professional and a nonprofessional lies in the element of superior skill. . . . However, some nonprofessional occupations actually involve a higher order of skill than many profesional ones. . . . The crucial distinction is this: the skills that characterize a profession flow from and are supported by a fund of knowledge that has been organized into an internally consistent system, called *a body of theory*. A profession's underlying body of theory is a system of abstract propositions that describe in general terms the classes of phenomena comprising the profession's focus of interest. Theory serves as a base in terms of which the professional rationalizes his operations in concrete situations. Acquisition of the professional skill requires a prior or simultaneous mastery of the theory underlying that skill. Preparation for a profession, therefore, involves considerable preoccupation with systematic theory, a feature virtually absent in the training of the nonprofessional. . . . Because understanding of theory is so important to professional skill, preparation for a profession must be an intellectual as well as a practical experience. On-the-job training through apprenticeship, which suffices for a nonprofessional occupation, becomes inadequate for a profession. . . .

Members of a profession share technical knowledge with each other. Any advance in theory and practice made by one professional is quickly disseminated to colleagues through the professional associations. The proprietary and quasi-secretive attitudes toward discovery and invention prevalent in the industrial and commercial world are out of place in the professional. Also out of place is the blatant competition for clients which is the norm in so many nonprofessional pursuits. . . .

The term career is, as a rule, employed only in reference to a professional occupation. . . . At the heart of the career concept is a certain attitude toward work which is peculiarly professional. A career is essentially a calling, a life devoted to "good works." Professional work is never viewed solely as a means to an end, it is the end itself. Curing the ill, educating the young, advancing science are values in themselves. The professional performs his services primarily for the psychic satisfactions and secondarily for the monetary compensations. Self-seeking motives feature minimally in the choice of a profession; of maximal importance is affinity for the work. It is this devotion to the work itself which imparts to professional activity the service orientation and the element of disinterestedness. Furthermore, the absorption in the work is not partial, but complete; it results in a total personal involvement. . . . To the professional person his work becomes his life. . . .

SURVEY PARTY'S FIELD WORK

CUT IN HALF

WITH THE

WOODMAN'S PAL

Whether you're clearing sight lines, pointing stakes in the field, cutting bench marks, blazing trails or clearing branch and brush obstructions, you'll find the WOODMAN'S PAL the best tool available for all around work. More than doubles your daily line coverage —from 6-8 acres using ordinary axe and brush knife to 18 acres using the WOODMAN'S PAL.

Blade is high carbon manganese tool steel, hardened and tempered to hold a razor-sharp edge. Basic model (shown above) has metal knuckle guard, trenching edge and soft pigskin grip. Takes the place of three ordinary tools; knife, axe and brush hook. Length, 16"; weight, only 22 oz.

Model with saw (not shown) has 9-pt. combination cross-cut and rip saw on the back edge. Cross-cuts up to a 6" log and rips a 3" plank. Hand-fitting, clear-lacquered hardwood grip with rawhide wrist thong. Takes the place of four ordinary tools; knife, axe, brush hook and saw. Length, 16½"; weight, only 16 oz.

284-B2 basic WOODMAN'S PAL w/metal safety sheath @ $8.50

284-C22 basic tool w/canvas zipper case; safety sharpening stone & 48-p. Use & Care book in inside pockets @ $11.00

461-S-C24 (not shown) w/9-pt. saw, canvas zipper case, safety sharpening stone & 48-p. Use & Care book in inside pockets ..... @ $17.00

Order the WOODMAN'S PAL best suiting your needs and start doubling the output of your survey party's field work. Send Check or Money Order direct; we pay postage. States WEST of Mississippi add 25¢.

THE VICTOR TOOL COMPANY, INC.
903 Oley, Berks Co., Penna.

CLARK — LAW OF SURVEYING and BOUNDARIES, 3rd Ed.

America's favorite volume on surveying revised up to the minute by John S. Grimes, lawyer, teacher and member of American Congress on Surveying and Mapping is now available at the price of $12.50.

We will be pleased to send you the Clark classic on a 30 day trial basis. If you are not satisfied after 30 days then return the book without any obligation.

Write direct to

Bobbs-Merrill Law Sales Division
1720 East 38th Street
Indianapolis 6, Indiana

LOCATE STAKES, MARKERS, MONUMENTS FASTER-MORE EASILY!

with the Time-Proved AQUA DIP NEEDLE LOCATOR

Here is the nation's most widely used locator that has helped utility companies for years to pinpoint hidden water and gas valve boxes quickly and effortlessly. The AQUA locator also is gaining ever increasing acceptance with surveyors, mappers and engineers, because of its simplicity, ruggedness and accuracy. Check the features below, then try the AQUA locator on the job for 15 days, FREE. Order, today.

Your Name in GOLD FREE!

LOOK AT THESE SUPERIOR FEATURES:

★ NO WIRES, BATTERIES or SWITCHES—Simple, powerful magnetic action, factory adjusted for YOUR geographical location, assures unfailing results!

★ NO NEEDLE SPINNING—Exclusive electric braking action saves you time!

★ NO STOOPING — Easy top-view reading!

★ RUGGED, COMPACT, ACCURATE, CONVENIENT!

★ GUARANTEED — to function regardless of weather, surface or ground cover!

★ 15-DAY FREE TRIAL — No money! No obligation! You be the judge!

$32.50 F. O. B. CIN., O.

See Your Blueprint Dealer or Write Direct to:

AQUA SURVEY & INSTRUMENT COMPANY

2026 Leslie Avenue, Cincinnati 12, Ohio

Map Information

This department was inaugurated for the purpose of bringing to the attention of the members information pertaining to the availability of maps, surveys, etc., with particular emphasis on how such material can be procured. It is believed that through an interchange and dissemination of such information maximum benefits will accrue to the surveying and mapping profession.—EDITOR

Topographic Maps

THE FOLLOWING quadrangle maps were published or became available for distribution by the U. S. Geological Survey between September 1 and November 30, 1959. The list includes newly compiled maps; revised maps on which contours and drainage usually are unchanged but the works of man are brought up to date; and series-converted maps which are 15-minute maps produced from four 7½-minute maps of the same area. The maps are new unless otherwise designated by numerical superscript.

The quadrangle name (in capital letters) is followed by the name of the county (in upper- and lower-case letters) that contains the place or feature for which the quadrangle is named.

All maps are available with or without the green overprint that indicates woodland. These maps show the shape and elevation of the land surface (represented by contour lines, printed in brown—except those marked with the letter (P), which are planimetric); water features (in blue); works of man, including cities, towns, and scattered habitations, schools, churches, railroads, roads and boundaries, place and feature names (in black); and woodland areas (in green). Principal roads are shown by a red overprint. In areas that have been covered by Bureau of Land Management surveys, township and section lines are shown. The State rectangular coordinate and the UTM 1,000-meter grid systems are indicated in the margins of the maps. An information folder further describing topographic maps is available on request.

Standard quadrangle maps may be obtained for 30 cents per copy. A discount of 20 percent is allowed on orders amounting to $10 or more at the retail price; a discount of 40 percent is allowed on orders amounting to $60 or more. Orders should be addressed to the U. S. Geological Survey, Washington 25, D. C., (or Denver 15, Colorado, for maps of areas west of the Mississippi River).

---

* Indicates 15-minute quadrangles; all others are 7½-minute quadrangles.
[1] Indicates a revised map.
[2] Indicates a series-converted map.
† Indicates availability in either a contour or shaded-relief edition.
‡ Indicates preliminary black and white edition.

Alabama

ATHENS[2]—Russell
CRAWFORD[1]—Russell
PHENIX CITY[1]—Russell
SEALE[1]—Russell

Alabama-Georgia

FORT MITCHELL[2]—Russell

Alaska

BRADFIELD CANAL A-1*
BRADFIELD CANAL A-2*
BRADFIELD CANAL B-2*
BRADFIELD CANAL B-4*
BRADFIELD CANAL C-5*
BRADFIELD CANAL C-6*
BRADFIELD CANAL D-6*
LIVENGOOD D-6*
TALKEETNA MOUNTAINS B-4*
TALKEETNA MOUNTAINS B-5*
TANANA B-1*
TANANA C-1*
VALDEZ A-2*
VALDEZ B-2*

Arizona

APACHE JUNCTION—Pinal
BISBEE—Cochise
BISBEE*[2]—Cochise
BLUE SPRING*—Coconino
BUCKHORN—Maricopa
CHANDLER HEIGHTS—Maricopa
CHIRICAHUA PEAK*—Cochise
DESERT WELL—Maricopa
FORT HUACHUCA*[2]—Cochise
GLEESON*[2]—Cochise
GOLDFIELD—Pinal
HAPPY VALLEY*[1]—Cochise
HEREFORD*[2]—Cochise
HIGLEY—Maricopa
LOCHIEL*[2]—Santa Cruz
MAGMA—Pinal
MARICOPA*[2]—Pinal
MILLER PEAK[1]—Cochise
SACATON NE—Pinal
SHINARUMP*—Coconino

SUPERSTITION MTS. SW—Pinal
TOMBSTONE*[2]—Cochise
WHITE TANK MTS.*—Maricopa

California

BLACK MOUNTAIN[1]—Los Angeles
BURNEY*—Shasta
BUTTE CITY*[2]—Glenn
CALIFORNIA HOT SPRINGS*—Tulare
COBBLESTONE MTN.[1]—Ventura
COTTONWOOD SPRING*—Riverside
DARDANELLES CONE*—Alpine
DUNNIGAN*[2]—Sacramento
EUREKA—Humboldt
FRAZIER MTN.[1]—Ventura
FRUTO*[1]—Glenn
JOHANNESBURG SW—Kern
LAMOINE*[1]—Shasta
LANCASTER EAST—Los Angeles
LEBEC[1]—Kern
LIEBRE MTN.—Los Angeles
LOST HORSE MTN.*—Riverside
MARYSVILLE*[2]—Yuba
MINERAL KING*—Tulare
MT. VACA*[2]—Napa
MYOMA—Riverside
ONTARIO*[2]—San Bernardino
PALM SPRINGS—Riverside
PINECREST*—Tuolumne
POINT REYES*[2]—Marin
PULGA*—Butte
RITTER RIDGE—Los Angeles
SAN BERNARDINO*[2]—San Bernardino
SONORA PASS*—Tuolumne
VACAVILLE*[2]—Solano
WARM SPRINGS MTN.—Los Angeles
WAUCOBA SPRING*—Inyo
WHITAKER PEAK—Los Angeles

California-Nevada

SOLDIER PASS*—Inyo

Colorado

CHROMO*—Archuleta
HOT SULPHUR SPRINGS*—Grand
IDAHO SPRINGS—Clear Creek
JEFFERSON—Park
OBSERVATORY ROCK—Park
PAGOSA JUNCTION*—Archuleta
SHADOW MOUNTAIN—Grand
STRAWBERRY LAKE—Grand
TOPAZ MOUNTAIN—Park
X LAZY F RANCH—Gunnison

Connecticut

MONTVILLE[1]—New London
NIANTIC[1]—New London
OLD LYME[1]—New London
OLD MYSTIC[1]—New London

Connecticut-New York-Rhode Island

MYSTIC[1]—New London

Florida

FORT MYERS—Lee
FORT UNION—Suwannee
HEDGES—Nassau
ITALIA—Nassau
MADISON SE—Madison
WEBSTER—Sumter

Florida-Georgia

FERNANDINA BEACH—Nassau
ST. MARYS—Camden

Georgia

BALDEN—Glynn
BRUNSWICK EAST—Glynn
BUENA VISTA[1]—Marion
BUENA VISTA NE[1]—Marion
BUENA VISTA NW[1]—Chattahoochee
BURROUGHS—Chatham
CARROLLTON*—Carroll
CATAULA[1]—Harris
CUMBERLAND ISLAND SOUTH—Camden
CUSSETA[1]—Chattahoochee
GENEVA[1]—Talbot
GLEN ALTA[1]—Marion
HARRIETS BLUFF—Camden
LOUVALE[1]—Stewart
LUMPKIN[1]—Stewart
LUMPKIN SW[1]—Stewart
MIDLAND[1]—Muscogee
MULBERRY GROVE[1]—Harris
OCHILLEE[1]—Chattahoochee
RACCOON KEY—Chatham
TALBOTTON[1]—Talbot
UPATOI[1]—Muscogee
WAVERLY HALL[1]—Harris
WOODBINE—Camden

Georgia-Alabama

COLUMBUS[1]—Muscogee
FORT BENNING[1]—Chattahoochee
FORTSON[1]—Muscogee
UNION[1]—Stewart

Georgia-Florida

KINGSLAND—Camden

Georgia-Tennessee

FORT OGLETHORPE[1]—Catoosa

Idaho

CALDER*—Shoshone
HARRIS CREEK SUMMIT—Boise
LAKE LOWELL—Canyon
LAPWAI—Nez Perce
MIDDLETON—Canyon
PIONEERVILLE—Boise
PLACERVILLE—Boise

Illinois-Indiana

EMMA—White

Illinois-Indiana-Kentucky

WABASH ISLAND—Union

Indiana

ALLENS CREEK[1]†—Monroe
BARTLETTSVILLE—Lawrence
BRANCHVILLE—Perry
BUTLER WEST—De Kalb
DARLINGTON—Montgomery
DONALDSON—Marshall
GATCHEL—Perry
GLENDALE[1]—Daviess
LA CROSSE—La Porte
LADOGA—Montgomery
NORMAN—Jackson
PIMENTO[1]—Vigo
STONEBLUFF—Fountain
VEEDERSBURG—Fountain
WHEATLAND[1]—Knox

Indiana-Kentucky

DERBY—Perry
UNIONTOWN—Union

Kansas

NEUTRAL—Cherokee
TYRO—Montgomery

Kentucky-Illinois

PADUCAH EAST[1]—McCracken
PADUCAH WEST[1]—McCracken

Kentucky-Ohio

GREENUP[1]—Greenup

Louisiana

FOLSOM*—St. Tammany

Maine

BLUE HILLS*[1]—Hancock
BOOTHBAY*[1]—Lincoln
FARMINGTON*[1]—Franklin
FREEPORT—Cumberland
LEAD MOUNTAIN*[1]—Hancock
LITTLE BIGELOW MTN.*[1]—Franklin
TUNK LAKE*[1]—Hancock

Maryland

EARLEVILLE[1]—Cecil
PORT TOBACCO[1]—Charles

Maryland-Virginia

INDIAN HEAD[1]—Charles

Massachusetts

CONCORD[1]—Middlesex
HULL[1]—Plymouth

Massachusetts-Connecticut

SOUTH SANDISFIELD[1]—Berkshire
TOLLAND CENTER[1]—Hampden

Massachusetts-Connecticut-New York

BASHBISH FALLS[1]—Berkshire

Michigan

ALLEGAN*—Allegan
ALLENDALE—Ottawa
BAYSHORE*—Charlevoix
COOKS*—Schoolcraft
CORNER LAKE*—Schoolcraft
ESCANABA*—Delta
FAIRPORT*—Delta
GARDEN*—Delta
GRAND PORTAL POINT*—Alger
LAUGHING FISH POINT*—Alger
MT. CLEMENS*[2]—Macomb
MUNISING*—Alger
PELLSTON*—Emmet
PETOSKEY*—Emmet
ROCK*—Delta
SKANDIA*—Marquette
STEUBEN*—Schoolcraft
TRENARY*—Alger

Minnesota

BUFFALO*—Wright
CERRO GORDO—Lac qui Parle
DASSEL*—Meeker
EXCELSIOR—Hennepin
GAYLORD*—Sibley
GLENCOE*—McLeod
GOOD HARBOR BAY—Cook
CRACELOCK NE—Chippewa
HOUSTON*—Houston
KERKHOVEN SE—Chippewa
KERKHOVEN SW—Chippewa
LAKE MINNETONKA*[2]—Hennepin
MILAN—Chippewa
MILAN NW—Chippewa
MOUND—Hennepin
SHAKOPEE—Scott
VICTORIA—Carver
WATSON—Chippewa
WINTHROP*—Sibley

Montana

CAPITOL MTN.—Flathead
EAR MOUNTAIN—Teton
LAKE THEBOE—Teton
MOUNT WRIGHT—Teton
OUR LAKE—Teton
TWIN LAKES—Teton

Nebraska

ARAPAHOE—Furnas
BEAVER CITY—Furnas
COLUMBUS SW—Polk
EDISON—Furnas
FULLERTON—Nance
HAVENS—Merrick
HENDLEY—Furnas
HOLLINGER—Furnas
INDIANOLA—Red Willow
MERCHISTON—Nance
MONROE—Platte
SILVER CREEK—Merrick
SILVER CREEK SE—Merrick
STAMFORD—Harlan
WILSONVILLE NE—Furnas
WILSONVILLE NW—Furnas

Nevada

ARROW CANYON*—Clark
BOULDER CITY—Clark

BOULDER CITY NW—Clark
CHARLESTON PEAK*—Clark
MOAPA*—Clark
MT. STIRLING*—Nye
NELSON*—Clark

Nevada-Arizona
MESQUITE*—Clark

Nevada-California
DOGSKIN MOUNTAIN*—Washoe
HUNTOON VALLEY*—Mineral
MAGRUDER MT.*—Esmeralda

New Hampshire
MT. PAWTUCKAWAY*[1]—Rockingham
SUNCOOK*[1]—Merrimack

New Jersey
WOODBINE—Cape May

New Mexico
AMBROSIA LAKE—McKinley
GOAT MTN.—McKinley
MOUNT TAYLOR—Valencia
TOHATCHI*—McKinley

New York-Connecticut
AMENIA—Dutchess

North Carolina
DEEP RUN*—Lenoir

North Dakota
BALFOUR*[2]—McHenry
BALFOUR NW—McHenry
BUTTE—McLean
CLIFTON—Pierce
DEVILS LAKE*[2]—Ramsey
DRAKE SE—Sheridan
FILLMORE—Benson
FLORA*[2]—Benson
GOLDWIN SW—Stutsman
GRAHAMS ISLAND*[2]—Benson
KONGSBERG NE—McHenry
MINNEWAUKAN WEST—Benson
PEKIN*[2]—Nelson
SAWYER*[2]—Ward
SILVA—Pierce

Ohio
AKRON EAST—Summit
AKRON WEST—Summit
CANAL FULTON—Stark
DOYLESTOWN—Wayne
NORTH CANTON—Stark
WADSWORTH—Medina

Ohio-Kentucky
IRONTON[1]—Lawrence

Ohio-West Virginia
ATHALIA—Lawrence

Oklahoma-Texas
FREDERICK*—Tillman

Oregon
ALBANY*[1]—Linn
STAYTON*[1]—Marion

Oregon-Washington
BONNEVILLE DAM*—Skamania

Pennsylvania
BESSEMER—Lawrence
EDINBURG—Lawrence
MILLHEIM*[1]—Centre
SAXONBURG—Butler
SHARPSVILLE—Mercer
WORTHINGTON—Armstrong

Puerto Rico
CABO ROJO[1]—Cabo Rojo
CAGUAS[1]—Caguas
CIALES[1]—Ciales
SABANA GRANDE[1]—Sabana Grande
SAN JUAN[1]—San Juan

Rhode Island
KINGSTON*†—Washington

South Carolina
CHARLESTON—Charleston
GREENVILLE*[1]—Greenville

South Dakota
AMHERST—Marshall
BRITTON 4 NW—Marshall
BRITTON 4 SW—Day
CONDE—Spink
HILLHEAD—Marshall
RANDOLPH—Brown
SPAIN—Marshall

Tennessee
ALEXANDRIA—De Kalb
BELLWOOD—Wilson
CHARLOTTE—Dickson
CHATTANOOGA[1]—Hamilton
CUMBERLAND FURNACE—Dickson
DIXON SPRINGS—Smith
EAST CHATTANOOGA[1]—Hamilton
FOUNTAIN HEAD—Sumner
LAFAYETTE—Macon
NEW MIDDLETON—Smith
PALMYRA—Montgomery
SLAYDEN—Dickson
TURNERS STATION—Sumner
VANLEER—Dickson
WESTMORELAND—Sumner

Texas
BAT CAVE—Comal
BERNARDO—Colorado
BRECKENRIDGE—Stephens
BRONSON*—Sabine
BULVERDE—Comal
BURTON—Washington
CARMINE—Fayette
CASTLE HILLS—Bexar
CONROE—Montgomery
COWL SPUR—Montgomery
CULEBRA HILL—Bexar
ELMENDORF—Bexar
EL PASO—El Paso
FAYETTEVILLE—Fayette
FRELSBURG—Colorado
GIDDINGS—Lee
GILPIN—Dickens
GREENVINE—Washington
HELOTES—Bexar
INDUSTRY—Austin
LEDBETTER—Fayette
LONGHORN—Bexar
LOVERS RESORT—Stonewall
MACDONA—Bexar
MARTINEZ—Bexar
MARTINSVILLE*—Nacogdoches
McGEE BEND*—Jasper
MEDICINE MOUND*—Hardeman
MERCEDES—Hidalgo
NATIONS EAST WELL—El Paso
NECHANITZ—Fayette
NORTH FRANKLIN MTN.—El Paso
OTIS RIDGE—Bexar
PROGRESO—Hidalgo
PURSLEY HOUSE—Kent
ROUND TOP*—Fayette
SAN ANTONIO EAST—Bexar
SAN ANTONIO WEST—Bexar
SAN AUGUSTINE*—San Augustine
SCHERTZ—Guadalupe
SOUTHTON—Bexar
TERRELL WELLS—Bexar
VAN RAUB—Bexar
ZAVALLA*—Angelina

Texas-Louisiana
CENTER*—Shelby
HEMPHILL*—Sabine

Texas-Oklahoma
DAVIDSON*—Tillman
ELECTRA*—Wichita

Utah
OREM*[2]—Utah

Vermont
EAST BARRE*[1]—Washington
SAXTONS RIVER*[1]—Windham

Virginia
CHESTER[1]—Chesterfield
CREWE*—Nottoway
DREWRYS BLUFF[1]—Chesterfield
DUTCH GAP[1]—Chesterfield
HOPEWELL[1]—Prince George
LEES MILL POND—Prince George
PETERSBURG—Dinwiddie
PRINCE GEORGE—Prince George
REAMS—Dinwiddie

Virginia-North Carolina
MOUNT AIRY*—Surry

Virgin Islands
CHRISTIANSTED—St. Croix
EAST POINT—St. Croix

Washington
BAY CENTER—Pacific
DESTRUCTION ISLAND*—Jefferson
ELLENSBURG SOUTH—Kittitas
HEMBRE MTN.—Yakima
LOUP LOUP*—Okanogan
MOCLIPS—Grays Harbor
OYSTERVILLE—Pacific

West Virginia
FAIRMONT EAST—Marion
HAMLIN—Lincoln
KETTLE—Roane
MORGANTOWN SOUTH—Monongalia
QUICK—Kanawha
SISSONVILLE—Kanawha
WALTON—Roane

West Virginia-Maryland
GREAT CACAPON—Morgan

West Virginia-Ohio
GLENWOOD—Mason

West Virginia-Pennsylvania-Ohio
STEUBENVILLE EAST—Jefferson

Wisconsin
PITTSVILLE*(P)—Wood
WISCONSIN RAPIDS*(P)—Wood

Wisconsin-Minnesota
SUPERIOR*[2]—Douglas

Wyoming
ARLINGTON—Carson
GAS HILLS[1]—Fremont
McFADDEN—Carbon
MOORCROFT*—Crook
NEFSY DIVIDE*—Crook
OSHOTO*—Crook

Wyoming-Montana
CEDAR RIDGE*—Crook
MONA*—Crook
SEELY*—Crook
MOUNT HOLMES*—Yellowstone National Park

Wyoming-South Dakota-Montana
COLONY*—Crook

In addition to the standard series of quadrangle maps, small-scale (1:250,000) maps of areas in the United States and Territories are being published and distributed. They may be purchased from the Geological Survey for 50 cents per copy. An index to the series is available on request.

Alaska
ARCTIC†
ATTU†
KATEEL RIVER
LOOKOUT RIDGE
PHILIP SMITH MOUNTAINS†
PORT ALEXANDER†
SAINT MICHAEL†

Colorado-Utah
GRAND JUNCTION

Kansas
BELOIT
HUTCHINSON

Minnesota-Wisconsin
SAINT PAUL

Montana
LEWISTOWN

Nebraska-South Dakota
O'NEILL

Nevada-Oregon-Idaho
McDERMITT

Wisconsin
RICE LAKE

The following National Park map is now available:

ACADIA NATIONAL PARK AND VICINITY,[1] MAINE (50 by 54 inches) 1:24,000 scale. $1.50.

State maps are also being published and distributed. These maps may be purchased from the Geological Survey for the prices indicated below.

#UTAH (base). (48 by 39½ inches) 1:500,000 scale. $1.00.
UTAH (topographic). (48 by 39½ inches) 1:500,000 scale. $2.00.

Special metropolitan and vicinity maps of major United States cities are being published and distributed by the Geological Survey. These maps are prepared from standard 7½-minute maps at the scale of 1:24,000. Vicinity maps may be purchased from the Geological Survey for the prices indicated below.

WASHINGTON AND VICINITY, D. C., MARYLAND AND VIRGINIA (50 by 72 inches) $1.50.

Lake Survey Charts

PUBLICATION of new editions of the following Lake Survey Charts has been announced by the United States Lake Survey of the Corps of Engineers, U. S. Army. Copies of these charts may be obtained from the U. S. Lake Survey, 630 Federal Building, Detroit 26, Mich., at 75 cents per copy. Payment is required in advance by P. O. money order or draft, payable to the Treasurer of the United States. A catalog showing the areas described below is available free upon request.

2.—Lake Ontario. General Chart of the entire lake, at 1:400,000 scale.
3.—Lake Erie. General Chart of the entire lake, at 1:400,000 scale.
31.—Lake Erie. East end of Lake Erie, from Morgans Point, Ontario, to Sturgeon Point, New York, including Niagara River and Welland Canal, at 1:80,000 scale.
32.—Lake Erie. Sturgeon Point, New York, to 20 Mile Creek, Pennsylvania, at 1:80,000 scale. Inset: Dunkirk Harbor, New York, at 1:15,000 scale.
35.—Lake Erie. Moss Point to Vermilion, Ohio, at 1:80,000 scale. Insets: Vermilion, Ohio at 1:10,000 scale, and Rocky River, Ohio at 1:10,000 scale.
37.—Lake Erie. Port Clinton, Ohio, and Colchester, Ontario, to mouth of Detroit River, at 1:80,000 scale. Inset: Port Clinton, Ohio, at 1:10,000 scale.
39.—Lake Erie. West end of Lake Erie, from Pelee Point, Ontario, and Sandusky, Ohio, to mouth of Detroit River, at 1:100,000 scale.
42.—Lake St. Clair. St. Clair River to Woodtick Island, at 1:60,000 scale. Inset: Clinton River entrance, at 1:30,000 scale.
171.—Lake Champlain. Richelieu River and Missisquoi Bay, Quebec, to South Hero Island, Vermont, at 1:40,000 scale.
184.—New York Canals. Lock 22 to Lock 23, including Oneida Lake, New York, at 1:40,000 scale.
211.—Lake Ontario. East end of Lake Ontario including Chaumont, Henderson, and Black River Bays, at 1:30,000 scale. Inset: Sackets Harbor, at 1:5,000 scale.
256.—Lower Niagara River. Niagara Falls to Lake Ontario, at 1:30,000 scale.
312.—Upper Niagara River. Niagara Falls to Buffalo Harbor, New York, at 1:30,000 scale.
412.—Trenton Channel and approaches thereto from the Ecorse, Wyandotte, and Ballards Reef Channels to the southerly limit of Federal improvement, at 1:15,000 scale. It also covers the Rouge River, at 1:10,000 scale, replacing Rouge River Chart No. 415 which will be discontinued.
743.—Milwaukee Harbor, Wisconsin at 1, 10,000 scale.
819.—Rainy Lake. Big Island, Minnesota, to Oak Point Island, Ontario, at 1:25,000 scale. Inset: Kettle Falls, Minnesota, at 1:10,000 scale.

Copies of the following Lake Survey Charts may be obtained at 25 cents per copy.

807.—Northern Light Lake, at 1:42,240 scale.
808.—Sea Gull Lake, at 1:42,240 scale.
809.—Saganaga Lake, at 1:42,240 scale.
812.—Western Part of Basswood Lake at 1:42,240 scale. Charts 807, 808, 809, 812, do not show hydrography.

THE FOLLOWING plats of public land surveys and resurveys were completed and accepted by the Bureau of Land Management between September 1 and November 30, 1959. The class or purpose of the survey is indicated. Copies of plats may be secured from the Bureau offices in the States or from the Director, Bureau of Land Management, Department of the Interior, Washington 25, D. C.

Alabama—Huntsville Meridian

T. 15 S., R. 4 E.—Survey of islands
T. 15 S., R. 5 E.—Survey of islands
T. 16 S., R. 4 E. (3)—Survey of islands
T. 17 S., R. 4 E. (4)—Survey of islands
T. 18 S., R. 3 E. (3)—Survey of islands
T. 18 S., R. 4 E.—Survey of islands

Alaska

U. S. Survey No. 3513—Small Tracts—Naknek Area
U. S. Survey No. 3529—Small Tracts—Kvichak
U. S. Survey No. 3539—Small Tracts—Naknek
U. S. Survey No. 3560—Small Tracts—Nornek Lake
U. S. Survey No. 3679—Recreation and Public Purpose Site, Naknek Area

Arizona—Gila and Salt River Meridian

T. 40 N., R. 8 E.—Extension survey
T. 40 N., R. 9 E.—Extension survey
T. 41 N., R. 8 E.—Extension survey
T. 41 N., R. 9 E.—Extension survey
T. 41 N., R. 9 E.—Page Townsite subdivision (35 plats)
T. 13 N., R. 11 W.—Survey of subdivisions
T. 13 N., R. 12 W.—Survey of subdivisions
T. 23 N., R. 13 W.—Dependent resurvey (part)
T. 2 S., R. 5 W.—Dependent resurvey (part)

California—Mount Diablo Meridian

T. 30 N., R. 13 E.—Dependent resurvey (part)
T. 22 N., R. 4 W.—Dependent resurvey (part)
T. 23 N., R. 4 W.—Dependent resurvey (part)
T. 22 N., R. 5 W.—Dependent resurvey (part)
T. 23 N., R. 5 W.—Dependent resurvey (part)

Colorado—Sixth Principal Meridian

T. 3 N., R. 76 W.—Resurvey and subdivision of section
T. 1 N., R. 91 W.—Resurvey and subdivision of section
T. 9 S., R. 89 W.—Dependent resurvey (part)
T. 10 S., R. 89 W.—Resurvey and subdivision of section

Colorado—New Mexico Principal Meridian

T. 35 N., R. 20 W.—Resurvey and extension survey
T. 36 N., R. 20 W.—Resurvey and extension survey

Florida—Tallahassee Meridian

T. 13 S., R. 11 E.—)
T. 14 S., R. 11 E.—) (1 plat) Survey of islands
T. 13 S., R. 12 E.—)

Idaho—Boise Meridian

T. 48 N., R. 1 E.—Dependent resurvey (part)

New Mexico—New Mexico Principal Meridian

T. 11 S., R. 23 E.—Dependent resurvey (part)
T. 4 S., R. 3 W.—Extension survey

North Dakota—Fifth Principal Meridian

T. 129 N., R. 58 W.—Dependent resurvey (part)
T. 129 N., R. 59 W.—Dependent resurvey (all)
T. 129 N., R. 60 W.—Dependent resurvey (part)
T. 130 N., R. 57 W.—Dependent resurvey (all)
T. 130 N., R. 58 W.—Dependent resurvey (all)
T. 130 N., R. 59 W.—Dependent resurvey (all)
T. 131 N., R. 57 W.—Dependent resurvey (all)
T. 132 N., R. 58 W.—Dependent resurvey (part)

Oregon—Willamette Meridian

T. 34 S., R. 7 E.—Survey of Chilquin Cemetery
T. 36 S., R. 11 E.—Survey of Jackson Cemetery
T. 21 S., R. 1 W.—Resurvey and subdivision of section
T. 22 S., R. 2 W.—Resurvey, part of exteriors
T. 20 S., R. 4 W.—Resurvey and subdivision of section
T. 25 S., R. 4 W.—Dependent resurvey (part)
T. 19 S., R. 8 W.—Dependent resurvey (part)
T. 41 S., R. 8 W.—Resurvey and subdivision of section

Utah—Salt Lake Meridian

T. 37 S., R. 4 E.—Skeleton survey
T. 37 S., R. 7 E.—Skeleton survey
T. 38 S., R. 2 E.—Skeleton survey
T. 38 S., R. 3 E.—Skeleton survey
T. 38 S., R. 4 E.—Skeleton survey
T. 38 S., R. 5 E.—Skeleton survey
T. 38 S., R. 6 E.—Skeleton survey
T. 38 S., R. 7 E.—Skeleton survey
T. 38 S., R. 8 E.—Skeleton survey
T. 38 S., R. 9 E.—Skeleton survey
T. 39 S., R. 3 E.—Skeleton survey
T. 39 S., R. 4 E.—Skeleton survey
T. 39 S., R. 5 E.—Skeleton survey
T. 39 S., R. 6 E.—Skeleton survey
T. 39 S., R. 7 E.—Skeleton survey
T. 39 S., R. 8 E.—Skeleton survey
T. 39 S., R. 9 E.—Skeleton survey
T. 39 S., R. 9½ E.—Skeleton survey
T. 40 S., R. 3 E.—Skeleton survey
T. 40 S., R. 4 E.—Skeleton survey
T. 40 S., R. 5 E.—Skeleton survey
T. 40 S., R. 6 E.—Skeleton survey
T. 40 S., R. 7 E.—Skeleton survey
T. 40 S., R. 8 E.—Skeleton survey
T. 40 S., R. 9 E.—Skeleton survey
T. 40 S., R. 9½ E.—Skeleton survey
T. 40½ S., R. 9 E.—Skeleton survey
T. 41 S., R. 2 E.—Skeleton survey
T. 41 S., R. 3 E.—Skeleton survey
T. 41 S., R. 4 E.—Skeleton survey
T. 41 S., R. 5 E.—Skeleton survey
T. 41 S., R. 6 E.—Skeleton survey
T. 41 S., R. 7 E.—Skeleton survey
T. 41 S., R. 8 E.—Skeleton survey
T. 41 S., R. 8½ E.—Skeleton survey
T. 41 S., R. 9 E.—Skeleton survey
T. 41 S., R. 10 E.—Skeleton survey
T. 42 S., R. 5 E.—Skeleton survey
T. 42 S., R. 6 E.—Skeleton survey
T. 42 S., R. 7 E.—Skeleton survey
T. 42 S., R. 8 E.—Skeleton survey
T. 42 S., R. 8½ E.—Skeleton survey

County General Highways Maps

THE FOLLOWING county general highway maps were received by the U. S. Bureau of Public Roads, Washington, D. C., during the period from September 1 to November 30, 1959. Copies of these maps are sent to the Washington office as part of the continuing cooperative Federal-State highway planning program, as they are completed or revised by the State highway departments.

Inquiries concerning prices, and orders should be sent to the respective State highway departments and not to the U. S. Bureau of Public Roads.

Arkansas
CONWAY
CRAWFORD
FRANKLIN
HEMPSTEAD
JEFFERSON
JOHNSON
LAFAYETTE
LITTLE RIVER
MILLER
PHILLIPS
POPE
SEBASTIAN
STONE
UNION
YELL

Georgia
BALDWIN
BARROW
BARTOW
BRYAN
DAWSON
FLOYD
GORDON
LAURENS
NEWTON
OCONEE
POLK
THOMAS

Kansas
BUTLER
CHASE
GOVE
JEFFERSON
MARION
MONTGOMERY
OSAGE
RAWLINS
WABAUNSEE

Kentucky
BOYD
BRECKINRIDGE
BULLITT
BUTLER
CALDWELL
CALLOWAY
CARTER
CHRISTIAN
CLINTON
CRITTENDEN
CUMBERLAND
DAVIESS
EDMONSON
FAYETTE
GRANT
GRAVES
GRAYSON
GREENUP
HANCOCK
HARDIN
HENDERSON
HOPKINS
JESSAMINE
JOHNSON
LAWRENCE
LIVINGSTON
LYON
McCRACKEN
McLEAN
MARSHALL
MEADE
MENIFEE
MUHLENBERG
OHIO
POWELL
ROWAN
RUSSELL
TODD
TRIGG
UNION
WEBSTER

Louisiana
IBERVILLE
LA FOURCHE
ST. JAMES
WASHINGTON

Minnesota
OLMSTEAD

Nevada
LANDER

North Dakota
BILLINGS
MORTON

Ohio
COLUMBIANA
FAIRFIELD
GREENE
HAMILTON
HIGHLAND
LICKING
LORAIN
MEDINA
PERRY
ROSS
SANDUSKY

Oregon
MALHEUR

South Dakota
BENNETT
CUSTER
DOUGLAS
JONES
SHANNON
TODD
WASHABAUGH

Tennessee
MAURY
WILLIAMSON

Utah
BEAVER

Manual of Photographic Interpretation

The American Society of Photogrammetry is about to publish its *Manual of Photographic Interpretation* as a companion volume to its *Manual of Photogrammetry*.

The new volume, approximately 800 pages, with over 600 black-and-white and color plates, including stereoscopic pairs, has been prepared by nearly one hundred recognized authorities from many parts of the world. It is being offered at prepublication prices of $10.50 to members of the ASP and $12.00 to nonmembers.

Orders should be addressed to: American Society of Photogrammetry (S&M), Attention, Deputy Chairman, PI Manual Sales Committee, 1515 Massachusetts Avenue, N.W., Washington 5, D. C. Remittance in full must be enclosed with order to secure the advantage of the prepublication prices, which are only in effect until April 1, 1960.

California Legislature Enacts Engineers-Surveyors' Bills

Four bills introduced in the California Legislature through the California Council of Civil Engineers and Land Surveyors were signed into laws in 1959, according to William A. White, Executive Director of the Council. These laws, relating to subdivision maps, land surveys, and civil engineering, make substantial contributions to the private practice of civil engineering in the State.

One of the more important enactments classifies land surveying in the civil engineering profession. Another measure upgrades the qualifications and requirements for a land surveyor's license and makes it comparable to engineer registration. A third bill provides for certain technical changes in subdivision maps to facilitate surveying.

The fourth enactment prevents quacks and other unqualified individuals from practicing land surveying by restricting the use of certain titles, i.e., land surveyor, land survey engineer, to licensed surveyors. This bill also requires public agencies to file their property maps with the County Surveyor. In this way, all information concerning property lines is made available to interested parties at a common office, local and accessible.

Comment and Discussion

DIRECTOR NEEDED FOR NORTH CAROLINA GEODETIC SURVEY

J. Edgar Kirk*—As you probably know, the General Assembly of the State of North Carolina in the last session made provisions for the establishment of the North Carolina Geodetic Survey with the function of extending in effect, the control system of the U. S. Coast and Geodetic Survey within the boundaries of the State of North Carolina. Administration of this organization was placed under the Department of Conservation and Development.

We are now interested in locating a man with proper qualifications to serve as director of this mapping agency. It would be our desire to locate a man with experience in the U. S. Coast and Geodetic Survey system or the equivalent, who would be interested in a career with the State of North Carolina, but who would have had enough experience to qualify him for a position of this importance. The type of man desired would be between the ages of approximately 35 and 45 and with registration as an engineer and a land surveyor in addition to his administrative experience.

Two of the members of the Commission which made a study on this question are members of the American Congress on Surveying and Mapping and recommended that we contact your magazine to request advice and assistance.

Please give some thought to our problem and if you find it possible, publish our need for a qualified director of this program.

* Assistant Director, Department of Conservation and Development, State of North Carolina, Raleigh, N.C.

GOVERNMENT OF GUAM NEEDS A CARTOGRAPHER

R. W. Galloway—The Government of Guam is urgently in need of a Cartographer. We feel that your activity is one of the best sources in obtaining assistance in the recruitment of the type of individual we need.

Would you please disseminate the following to eligible and interested candidates:

Minimum salary—$5,980.00

Maximum salary—$7,475.00

Two-year contract offered. Furnished housing provided at reasonable rental rate. Twenty-six days leave per year. Transportation for employee and dependents furnished to and from Guam.

Type of Qualifying Experience:

(a) Graduation with a bachelor's degree from a recognized engineering school or college, with major study in surveying; or

(b) Graduation from high school, plus four years progressively responsible experience, including cartography, cadastration, geodesy, engineering, and photogrammetry; or

(c) Any equivalent combination of experience and training.

Travel and processing take about three to four months.

For further information, write *via air mail* to: R. W. Galloway, Director, Department of Labor and Personnel, Government of Guam, Agana, Guam.

Any assistance given this request will be greatly appreciated.

METRIC SYSTEM QUESTIONNAIRE

Floyd W. Hough*—The American Geophysical Union's Special Committee for the Study of the Metric System in the United States has noted your publication of our "Letter to the Editor" and its accompanying Questionnaire which we forwarded to you early in 1959.

We wish to express our sincere appreciation for your courtesy in presenting this matter to your readers. Through you, we wish also to thank your members who aided the Committee

* Chairman, American Geophysical Union Special Committee for the Study of the Metric System in the United States.

by a generous response of completed questionnaires. Many of the replies included letters containing helpful suggestions and offering financial assistance if requested.

Those of your readers who have access to the September 1959, *Transactions* of the American Geophysical Union will find there a full report of the Committee, together with an analysis of the replies to the Questionnaire received up to July. At this date, three months later, 1080 have been analyzed. The scientific and engineering field was rather well covered by publication last spring of the Letter or Questionaire, or both, in eight of the leading journals and magazines of the United States. Briefly, to the most significant question as to whether it would be desirable to replace the English System with the Metric as the "only official system" of weights and measures in the United States, 90 percent have replied in the affirmative. The average suggested period of transition was about 22 years; this indicates agreement with the Committee on the necessity for a long transition period to avoid economic dislocation through education in the schools, through a normal retirement of presently active older personnel, and through the normal obsolescence of existing equipment.

The Congress of the United States, for the first time in nearly 30 years, is faced with a decision on metric legislation, recently introduced in both Houses. House Bill, HR7401, May 1959, by Mr. Brooks of Louisiana, and Senate Bill, S2420, July 1959, by Mr. Neuberger, both call for a feasibility study of the problem by an appropriate Government agency, with fund authorization. A third action of interest is the introduction in July 1959, by Representative Fulton, of House Concurrent Resolution 364 which would place the Congress on record in favor of the Metric System.

It is apparent that the United States must soon decide whether to change over gradually, during the next generation, to a far simpler and more logical system of weights and measures or to continue to live in comparative isolation with the remaining 10 percent of the world's population not yet under the Metric System.

₹ ₹ ₹

Do-it-yourself Forecasters Start Boom in Barometers

The barometer is taking its place beside the thermometer as a handy household instrument. But do-it-yourself forecasters are not likely to put the Weather Bureau out of business. In fact, the current barometer boom has kept the weather men busier than ever. Weather officials in Washington have averaged up to 100 calls a day from people who need help in adjusting and reading their barometers.

Amateur meteorologists soon discover that there is more to forecasting than a quick glance at an instrument that measures atmospheric pressure. However, the barometer remains one of the most important tools of weather science. Curiously, its origin may be traced back to the same 17th-century genius who invented the thermometer, Galileo Galilei.

Galileo observed that a pump would not lift water more than about 34 feet. At that time, scientists believed that a pump worked because "nature abhors a vacuum." But why, Galileo pondered, should nature stop abhoring a vacuum at 34 feet?

His pupil, Evangelista Torricelli, found the answer. In 1643 Torricelli sealed a long glass tube at one end and filled it with mercury. When he inverted the tube in a cup of mercury, some of the liquid metal ran out but about 30 inches remained.

After more experiments, Torricelli decided that the only possible explanation was that the weight of surrounding air exerted a pressure on the mercury in the cup. He noticed another curious fact: a drop in the level of the mercury often preceded bad weather, while a rise generally signaled an improvement.

Thus the barometer was born. Four years later Blaise Pascal, the French philosopher and mathematician, asked his brother-in-law to test the effect of altitude on the mercury in such a barometer. Just as Pascal suspected, the mercury fell when the tube was taken to the top of a mountain. The experiment confirmed the theory that the height to which mercury rises in a barometer or Torricellian tube is directly related to the weight of air above it.

Torricelli's barometer is still used, but the aneroid barometer is more popular because of its smaller size, portability, and rugged design.

A fantastic story is told of a householder who found that his new barometer registered "stormy" no matter how vigorously he tapped it. Angrily he repacked the instrument and took it back to the store. When he returned, amid steadily worsening weather, he found that his home had blown away.

National Geographic Society

News of Related Organizations

Central Massachusetts Association of C.E.&L.S.

Past Secretary Arthur N. Parmenter reports that the following officers have been elected to serve the Central Massachusetts Association of Civil Engineers and Land Surveyors for the year 1960:

President—Joseph Riney
Vice President—Winston Fox, Holden, Mass.
Secretary-Treasurer—John Bunikus, Boylston, Mass.

Alaska

In a recent meeting, in Anchorage, Alaska, nearly one-half of the registered land surveyors in the State of Alaska got together and decided they wanted to organize as has been done in many of the southern States. They elected to be known as "The Alaska Society of Professional Land Surveyors," and I was appointed their chairman until we can get a charter drawn up, hold a regular organizational meeting, and elect officers.

Although we want to be a professional society, we would like to be affiliated with the American Congress on Surveying and Mapping, hence this letter. Mainly, we would like to know just what is required for us to become affiliated with ACSM. Any other information, such as charter, bylaws, membership, etc., which you might have would certainly be greatly appreciated.

The above is from a letter addressed to Executive Secretary Walter S. Dix, in December 1959, by Maurice P. Oswald, Chairman. —EDITOR

Kansas Society of Land Surveyors

The Kansas Society of Land Surveyors held a very successful annual convention in Wichita on October 23 and 24 at the Broadview Hotel.

October 23 was devoted to registration and a general "get acquainted" session, as well as a State Directors' Meeting to process the current business for the Society.

On October 24, the convention was formally opened by State President James L. Bell of Prairie Village with a short talk in which he reported on the various actions of the Society since the convention of the preceding year, including the fact that paid up membership in the Society had increased by approximately 70 percent.

The principal speaker of the day was Bryan R. Hanke, Chief, Land Planning Section, Federal Housing Administration, Washington, D. C. Mr. Hanke addressed the group on "FHA Procedures and Requirements Affecting Land Surveyors." This was a very instructive and interesting talk and gave the land surveyor an insight into the background of various FHA requirements and how they can be used to the best advantage of the developer and builder in the coordination of the land surveyor's service to his client. Following this was the traditional surveyor's "bull session" in which problems and comments were invited from the floor. As usual, the allotted time expired before it was possible to make more than a small beginning on the items which the attending surveyors desired to discuss.

The speaker for the Surveyors Luncheon was Vince Bogart, former State Representative from the Wichita area. His speech included some very instructive comments and advice concerning procedures and actions for obtaining surveyor legislation.

The afternoon was allotted to a business session, the high-light of which was the Legislative Committee's report and plans for legislative action at the next session of the Kansas Legislature.

The newly elected officers of KSLS are as follows:

President—Charles N. Pfarr, Allied Engineering Co., Box 352, Topeka, Kansa.
Vice President—Wendell Wyatt, R.F.D. 2, Box 168, Salina, Kans.
Secretary-Treasurer—John T. Kramer, Allied Engineering Co., Box 352, Topeka, Kans.
Director (3 years)—Eugene E. McCracken, Shawnee County Surveyor, Court House, Topeka, Kans.

—JAMES L. BELL
Director, KSLS

Virginia Association of Surveyors

The Virginia Asosciation of Surveyors recently issued its first directory. This fine piece of work contains, in addition to the alphabetical and geographical listings of members, a roster by chapters, the list of officers and committeemen, the Constitution and Bylaws of VAS, the Canons of Ethics for Surveyors, and a brief history of the Northern Virginia Chapter. Also included in the 48-page pamphlet is a list of the political divisions of the Commonwealth of Virginia, giving the names of the Clerks of Court for each.

Plans are underway for the formation of a sixth chapter (the third this year).

The Association will hold a full two-day annual meeting in Williamsburg on January 15 and 16, 1960. This will be the Eleventh Annual Meeting for this group.

—Robert C. Eller

The Twelfth Annual Meeting of the Virginia Association of Surveyors was held in Williamsburg, Va., January 15 and 16, 1960. Friday morning was occupied with registration and a full room of exhibits. While the ladies and children attended movies and craft-shop tours, the Friday afternoon sessions for the men included annual reports, discussion of fees schedule, and a panel on ethics. The annual get-together party was held Friday evening. Saturday morning was taken over by the exhibitors who gave short talks and then participated in a session of questions and answers from the floor. The ladies and children went on a tour of nearby plantations, with lunch at the Berkely Plantation. The men's luncheon featured Mr. George Passage, Editor of the *Daily Press,* Newport News, and State Delegate Russel Carneal. The afternoon meeting featured talks by Sam Dobyns, President of the State Examination Board, who presented a proposed index for a Virginia Land Surveyor Manual; Boyce C. Outen, Lawyers Title Insurance Corporation, who presented standards for title surveys; and A. K. Hunsberger, Virginia Department of Highways, who discussed controlled access highways. Discussion from the floor followed each talk, and the lively questions clearly indicated the great interest in these subjects. The concluding business session included the adoption of a fees schedule which had been two years in processing. The Annual Banquet and Dance took place Saturday evening, and included the distribution of many prizes donated by the exhibitors. Walter S. Dix, Executive Secretary of ACSM, and Earl Palmer, Executive Secretary of ASP, were guests of honor at the banquet.

Accomplishments of VAS for the year included the formation of three new chapters which brings the total to six, increase in paid membership to 185, payment of all legal fees, issuance of a directory of the Association, putting all State and chapter elections on the same time basis, working closely with the State Examining Board, getting the fees schedule in final shape, and reprinting and mailing to all CLS the Canon of Ethics.

Altogether, over 150 persons attended the meeting, which was the most successful one VAS has ever had—and among the most enjoyable. The meetings were climaxed by the installation of all chapter and State officers. The new officers of VAS are:

President—E. Stuart Ball,
Vice President—Merlin McLaughlin,
Secretary—A. L. Cherry, and
Directors—Cecil J. Cross and Lee Carpenter.

Clifford Thorpe was given special mention for his work as Affiliate-Member Chairman, and Merlin McLaughlin was given special mention for his work as Secretary. Outgoing President Victor H. Ghent received a Past President's plaque and a special award for his services.

Indiana Society of Professional Land Surveyors

The following is quoted from *Surveying and Mapping Newsletter,* December 1959, Vol. V, No. 1, issued by the Indiana Society of Professional Land Surveyors—Division of Adult Education, Purdue University, Lafayette, Indiana—Ken S. Curtis, Editor. —Editor

Enclosed with this new letter is a copy of the program for the eighth annual Indiana Land Surveyors' Conference which will be held in the Memorial Center at Purdue University. The program-planning committee of ISPLS has worked hard to prepare a program which will be most interesting and worthwhile to those who attend. A ladies program has also been arranged for Friday and Saturday, so bring the "little woman" with you.

Please note that the regular conference will be held on the usual Friday and Saturday; however, because of the interest shown by a number of land surveyors, there will be a special one-

day work conference on "Computations for the Land Surveyor" on the preceding Thursday, January 14. Advance registration must be made for this special day. This will be a day in which we will roll up our sleeves and go back to school!

Saturday is primarily devoted to the subject of subdivision planning, approvals, computations, surveying, and easement planning and legal aspects. Friday will feature Kemmer's interpretation of the idealistic land surveyor and a summary of the A.C.S.M. nation-wide salary and fee study. Copies of this report will be distributed. A new type of program has been arranged for Friday afternoon with six different discussion booths and an orderly movement of the conferees from one to another. These will involve informal discussions in small groups.

There will be no featured after-dinner speaker for the dinner meeting on Friday evening except for a short talk by Dean Lawshe and Charlie Condra's film.* This will permit all conferees to attend the Broadway play "Look Homeward Angel" in the Music Hall. . . .

This meeting will be a highlight in the year's activities of the land surveyors in Indiana. A number of instrument companies will again have surveying equipment on display.

---

* *See* SURVEYING AND MAPPING, December 1959, Vol. XIX, No. 4, page 513, column 1, first two paragraphs. —EDITOR

ɾ ɾ ɾ

The Nigerian College of Arts, Science and Technology, Department of Land Survey

The Nigerian College of Arts, Science and Technology was set up by the Federal Government of Nigeria in the year 1952. It is a unitary institution with branches in each of the three Regions of the Federation. The Principal, Dr. C. A. Hart, C.M.G., T.D., D.Sc. (Eng.), Ph.D. F.R.I.C.S., controls all three branches from the College Headquarters at Zaria in the Northern Region. Each branch is under the immediate charge of an Assistant Principal.

The Department of Land Survey is situated at the Enugu Branch of the College, which is the most recently developed of the three and is at present the smallest. In each branch a considerable percentage of students are engaged upon intermediate courses in the basic Arts and Sciences leading in most cases to the College professional courses. The only other professional course at present developed at Enugu is in Estate Management, the students of which are also working for the examinations of the Royal Institution of Chartered Surveyors.

The Land Survey course is in charge of Mr. R. F. de Jong, who holds the Diploma of Land Survey of the University of Wageningen and has had long experience both as a practical surveyor and as a Principal of a Survey School under the Royal Dutch-Shell group of companies. He is assisted by a senior lecturer, Mr. A. V. Lawes, M.A. (Cantab), F.R.I.C.S., and a lecturer Mr. L. G. Baker, Diploma in Photogrammetry (Lond.), A.R.I.C.S. Both are experienced practical surveyors with service in Colonial Survey Departments. In addition there is a technical instructor, Mr. R. S. Warters, who has come to the College after 30 years with the Ordnance Survey. Assistance is provided to the Department by part-time lecturers from the Government of Eastern Nigeria.

The course has been recognized by the Council of the Royal Institution of Chartered Surveyors for the taking of the First and Intermediate examinations of the Institution. The first students entered the College in the session beginning October 1956 and in the first R.I.C.S. examination in April 1958 four students were successful and a further six who have taken a referred subject are now in the Intermediate course. The Intermediate examination will be taken for the first time in April 1960. There are at present 14 students in the first, 16 in the second and 10 in the third year of the course, which is designed to last three-and-a-half years up to the Intermediate examination. Students come from all the Regions of the Federation and, although the majority are sponsored by the Survey Departments of their Government, the courses are open to suitably qualified students who wish to qualify as surveyors in private practice.

Reprinted from the *Empire Survey Review*, Vol. XV, No. 113, July 1959, pages 146–7.

(Continued from page 94.)

Sixteen sheets of the series are on the Mercator projection, extending from the Equator to 72° north and south latitude, and eight Polar sheets. The Polar areas are charted on a gnomonic projection with each Polar area divided into quadrants extending to the 72nd parallel. The Polar gnomonic charts are at the scale of 1 : 3,100,000 at latitude 72° where they join the Mercator charts.

The Second Edition of the Prince of Monaco's General Bathymetric Chart was begun in July 1910. The first sheets of this edition were published in 1912 and the entire edition was finally completed in 1927.

After the death of Prince Albert I of Monaco in 1922, the organization for producing the charts was disbanded with no further work being carried on until the First Supplementary International Hydrographic Conference was held in 1929. This conference adopted a resolution instructing the International Hydrographic Bureau to take over the maintenance of the General Bathymetric Chart of the Oceans. This action was confirmed at the I.H.B. conference of 1932, specifying that the series was to be maintained without any change in sheet layout, projections, or scale. In accordance with this decision, work was started by the I.H.B. in 1932 on the Third Edition with sheet A-1 of the North Atlantic Ocean, now superseded by the new edition, being first for recompilation.

Many factors were considered in developing specifications for the Third Edition of the chart to satisfy the needs of various potential users. Biological and geophysical oceanography were considered, as well as physical oceanography. Biologists are chiefly interested in animal life in the seas and the development of fisheries, requiring information concerning depths and accurate geographic locations. Geophysicists require information on the chemical composition of sea water, characteristics of ocean tides and currents, the upwelling of deep sea water, temperature and salinity distribution, and other properties.

In the physical area, geologists require charts for use in studying the evolution of the earth's crust, characteristics of the sea bottoms, and changes in coastline. The charts are invaluable to geographers for studies of the sea in connection with geographical science. The basic requirement, however, is the need by hydrographers and navigators for information on ocean depths, together with tidal characteristics and the peculiarities of ocean currents. In making these charts applicable for various requirements, the portrayal of the bathymetry of the oceans with particular attention to depth curves was a primary problem, especially in vast unexplored oceanic areas.

The Third Edition revision did not include the four North Polar sheets and two Antarctic sheets, one of which does not contain any sea area. With these exceptions, the Third Edition was completed in 1955, to finalize the project initiated in 1932.

Copies of the first sheet of the Fourth Edition are sold at $4.00 each and those of the Third Edition are sold for $3.00 or $4.00 each (depending on the date of issue) by the International Hydrographic Bureau, Monte Carlo. Supplementary pamphlets may also be obtained for each sheet, at $1.00 each, which provide details concerning the preparation of the respective sheets and a wealth of pertinent statistical information.

Bathyscaph Goes Down Over Seven Miles

The U. S. Navy bathyscaph *Trieste* dived to a record depth of approximately 37,800 feet on January 23, 1960, and reached bottom at what is, so far at least, the deepest known spot in the oceans. The dive was made at a place about 250 miles southwest of Guam and over the Marianas Trench. The deepest known spot in this trench was found in 1957 by the Russian ship *Vityaz* which recorded a sounding of approximately 36,200 feet. The new depth is about 1,600 feet greater than was previously found.

Lieutenant Don Walsh, U. S. Navy, was in command of the *Trieste* during this historic dive and was accompanied by Jacques Piccard, son of the designer and builder of the bathyscaph.

The bathyscaphy weighs about 70 tons, is 50 feet in length, and 11 feet deep, with a 6½-foot spherical cabin, from which observations are made, attached to the bottom of the roughly cylindrical float. The descent required about 4¼ hours, and the ascent was completed in about 3¼ hours. Time spent on the bottom was approximately ½ hour.

Congress News

Louisiana Section

A cocktail party was given by the Louisiana Section, ACSM, for members and their wives, at the home of F. C. Gondolfo, Jr., on October 23, 1959. Eighty persons attended the party.

The regular quarterly meeting of the Louisiana Section was held Tuesday night, November 24, 1959, in the Engineers Club of the DeSoto Hotel, New Orleans, Louisiana.

After a social hour, a short business session was held, with Chairman Robert C. Dayton presiding. The Chairman announced to the members present that a subsection of the Louisiana Section, ACSM, was being formed in Lafayette, Louisiana. Should the idea prove feasible, it is contemplated that subsections will be established in other cities in the State.

The Chairman then introduced Dr. H. A. Bernard, Senior Research Geologist for Shell Development Company, Houston, Texas, who presented a program consisting of slides and a discussion of "The Mississippi Delta: Its Principal Features and Development."

The meeting was attended by fifty members and visitors.

—R. S. Burnside, Jr.
Section Editor

Through the courtesy of R. C. Dayton, Chairman, Louisiana Section, ACSM, we are in receipt of a copy of the 1959 roster of officers and members of the Louisiana Section. This attractive 5⅜ by 8⅜, 24-page booklet lists the officers, directors, and past chairmen from 1954–1958, inc., as well as the names, mailing addresses, and employment for the 125 paid-up members of the Section.

—Editor

St. Louis Section

The St. Louis Section voted on five proposed changes in its constitution and heard Lieutenant Colonel Russell J. Wilson discuss activities of the St. Louis Engineer District at its meeting of October 20, 1959, in the cafeteria of the Aeronautical Chart and Information Center in St. Louis. Sparked by cocktails and a good dinner, by a controversial constitutional proposition, and by an enthusiastic speaker with a subject of apparent special interest to the audience, the meeting was a lively and successful occasion, with 157 members and friends in attendance.

Chairman Finnie called the meeting to order promptly at 6:45 p.m., and took occasion to commend the committee chairmen who had contributed so well to the excellent turnout: Murray Berg, Membership; Henry Thomas, Publicity; and Charles Frey, Program.

Secretary Edward J. Bronczyk presented five proposed changes in the Section constitution for vote. These were mainly to clarify ambiguous sections and four of them were readily adopted by strong margins. These were: (1) a change in wording of Article IV, to set the local dues at $1.00 per year specifically, in place of a one-time assessment as previously worded; (2) and (3) two changes in Article V, one to specifically include all Directors, along with the Section officers, in the Board of Directors, and the other to include the Vice Chairman of the Section in the one-term succession limitation formerly imposed only on the Chairman; (4) the addition of a tenth committee, "Map Reproduction."

The fifth proposal called for a change in Article IX to permit the ratification of amendments or additions to the constitution by show of hands at a business meeting rather than by letter ballot as required by the existing provisions. This proposal was defeated by a very close margin—at final count by only two votes.

Colonel Wilson, Executive Officer of the St. Louis U. S. Army Engineer District, gave a highly informative talk on the work of the Engineer Department, particularly regarding the Mississippi River waterway and works in the St. Louis area. Both he and his audience were enthusiastic about his subject and question-and-answer discussion was lively throughout the talk.

—K. R. Deardorf

The following is quoted from the November 1959 issue of the St. Louis Section Newsletter.
—Editor

Following the customary social hour and an excellent turkey dinner at the cafeteria of the Aeronautical Chart and Information Center,

Section Chairman Tom Finnie called the November 17 meeting to order and quickly disposed of the small amount of business that was to be presented on this occasion. He then turned the affair over to Charlie Frey, Chairman, Program Committee, who introduced the two speakers of the evening.

The first was Lee Opheim, a man who started working at the Aeronautical Chart and Information Center in August 1957. After participating as a student in the Center's Cartographer Training Program, Lee was employed for a period in the Chart Research Division of the Center. Then he returned to the Training Program where, after serving about a year as an Instructor, he resigned early in September 1959 to accept a teaching assignment at St. Louis University. At the University, Lee and Bob Tice, another former ACIC employee whose career with the Center closely paralleled that of Lee, have been the guiding lights in establishing both undergraduate and graduate curriculums in Cartography. Professor Opheim's remarks at the November meeting consisted of a description of the newly-established St. Louis University course of study leading to a Master's Degree in Cartography.

The second speaker was Professor Fred Doyle, of the Institute of Geodesy, Photogrammetry and Cartography at Ohio State University. This speaker's topic was "The Crisis in Survey Education." His remarks were in effect a summary of a recent Ottawa, Canada, symposium on education, in which he participated. In his talk Professor Doyle told of the relationships and overlaps between many types of surveys, such as land, engineering, control, geodetic, oceanographic, etc., and he discussed varying educational programs needed to prepare men to become proficient in these areas.

He also spoke of the recent trend toward allying cartography with the geodetic sciences, with the resulting recognition of Cartography as a profession in its own right, rather than considering it to be a secondary field of other professions such as Engineering.

A spirited question-and-answer period followed Professor Doyle's talk.

Education Division

In September 1959, the Education Division, ACSM, conducted a pilot survey of 200 firms and agencies in California pertaining to personnel needs in the field of surveying and mapping. This is a prelude to a nationwide survey of the same nature and was undertaken to determine what response a nationwide survey might enjoy, and to determine what improvements should be made in the form and substance of the pilot questionnaire.

The purpose of the study itself is to obtain data having to do with the demand for numbers and quality of professional and technical personnel to be placed in surveying and mapping activities. Based on the findings, ACSM can then, presumably, make recommendations to the colleges and universities concerning their surveying and mapping programs.

Of the 200 firms polled, 103 responded by answering the questionnaire. These firms represent a total of 2,515 professional and technical personnel engaged in surveying and mapping. Of this number 28% were from highways and railroads, 13% from utilities, 22% from city engineering, 20% from county roads, surveyor and public works, 12% from private engineering firms, and 6% from Federal agencies. A 100% return was realized from the eleven districts of the California Division of Highways.

In answer to some of the more subjective questions asked in the pilot survey, the most frequent criticisms of personnel educated or trained for surveying and mapping were, in the professional area: (1) lack of knowledge of legal aspects of land surveying; (2) lack of practical field experience; (3) cannot interpret deeds and records; (4) cannot interpret or evaluate field evidence; (5) no appreciation of accuracy versus economy; and (6) poor attitude toward surveying obtained from college teachers. In the technical areas, the frequent criticisms were: (1) mathematics deficiency (overwhelming); (2) lack of knowledge of field survey methods and techniques; (3) lack of practical field experience; and (4) lack of knowledge of legal aspects of land surveying.

—Francis H. Moffitt
Chairman

Northern California Section

The annual meeting of the Northern California Section, ACSM, was called to order at 7:15 p.m., Friday, November 20, 1959, in the new U. S. Geological Survey building at Menlo Park, California. Chairman William A. Angeloni received a gavel which was presented as a small token of appreciation of his outstanding service to the Section during 1959.

Professor C. J. Aggeler reported on the Education Program and requested answers to his

questionnaire on the subject of the surveyor and planner. He is to present a report at the joint ACSM-ASP meeting in Washington, D. C., during the week of March 20–26, 1960.

The Chairman of the Committee of Tellers, V. S. Seward, announced the outcome of the balloting which resulted in the election of the following officers and directors for 1960:

Chairman—Paul Dowling, Santa Rosa
Vice Chairman—Daniel P. Coleman, San Francisco
Secretary-Treasurer—Charles E. Randlett, Redwood City
Editor—C. H. Drown, Sacramento
Directors (1960–61)—C. M. Harrington and Frank T. Maguire. Holdover Director W. A. White and 1959 Chairman W. A. Angeloni will also serve as Directors for 1960.

Robert O. Davis, Pacific Region Engineer, U. S. Geological Survey, greeted the meeting and introduced several visitors from the East Coast and neighboring States who were in the area for the official dedication of the new U.S.G.S. building on November 24, 1959. He then presented the guest speaker, George D. Whitmore, Chief Topographic Engineer, U.S.G.S. from Washington, D. C., who spoke concerning the A.S.C.E. Task Committee Report on the Status of Surveying and Mapping. Being a member of that committee he covered the subject from the standpoint of an expert, and his presentation was thoroughly enjoyed by the attentive audience. Open discussion followed until the meeting was adjourned at 9:15 p.m.

—James Brennan
for
Daniel Coleman
Secretary-Treasurer

Joint Meeting of Boards of Northern & Southern California Sections

The Boards of the Northern California Section and the Southern California Section, ACSM, met in joint session October 30, 1959, during the Western Regional Conference at the Los Angeles Statler-Hilton Hotel.

ACSM President Bestor appeared briefly to bring greetings and compliments to both Sections from ACSM National Board, convened elsewhere, and praised the Southern California Section on the success of the Western Regional Conference so ably sponsored by them. Southern's Chairman, A. V. Cocking, thanked Northern's Chairman, W. A. Angeloni, for the Northern Section's effort in supporting the Conference. A motion to publish the Conference papers was carried.

Chairman William A. White of NCS Licensing Committee reported on the Section's participation with the State Board on Examination as to questions which were given in August to some 215 candidates, results of which examination were not complete at the time of reporting. Future land surveying tests are to be in two stages. Procedure, regulations, and a syllabus of material for the examinations are now in preparation. It is too early for conclusions or predictions.

NCS Chairman Angeloni briefly presented the Legislative Committee report of Oliver Deatsch, which was discussed. The report indicated that the legislative process is that of "hurry up and wait," with many ideas proposed, some taking bill form and introduced but with many lost at the start, with constant alert required to monitor the "lost ideas" which pop up as amendments as opportunity presents, favorably sometimes, adversely sometimes—especially if they sneak up on your blind side. Vigilance is needed against detrimental bills. Coordinated aggressive supporting action is required to promote good bills for professional improvement. It is always necessary to guard against indefinite wording. "Facets of the problem" must be well reviewed before steps toward legislative action are taken. Liaison with other professional groups is in good interest toward "obtaining the concensus," as is a public hearing "to feel the pulse of the situation." The affirmative position is the criterion of the Legislative Committee on all legislative matters indicating progress toward objective achievement of: (1) Raising the standards of surveying and engineering practice; (2) Recognition of surveying as a branch of the Engineering Profession; (3) Reduction of possibilities of malpractice; (4) Raising educational standards; (5) Accentuating concern for public health and safety; (6) Facilitating application of existing statutes; (7) Clarification of existing statutes; (8) Requiring examination or demonstration of proficiency in land surveying before practicing; (9) Facilitating and increasing recordation of surveys; and (10) Providing monumentation and safeguards thereof. It was stressed that an active legislative committee must complement any activity of committees working for the increased tech-

nological ability of the members of the organization.

Mr. Angeloni read a part of the report on property surveys and this was discussed briefly.

Mr. Cocking then took the chair. Announcement was made by Professor Kulhan that another San Joaquin Valley Surveyors Conference would be held at Fresno State College on Good Friday and Saturday 1960. Following minor routine matters, the meeting was adjourned.

Abstracted from minutes and reports received from Southern California Section Secretary, J. J. Cooper, by Walter S. Dix, Executive Secretary, ACSM.

Western Regional Meeting 1960

The 1960 Western Regional Meeting, American Congress on Surveying and Mapping, is being planned for some time in October 1960. Plans call for the conference to be held under the cosponsorship of the Texas Surveyors Association (a recent affiliate of ACSM) and the Texas Section of ACSM, in conjunction with the Texas Surveyors Annual Short Course, at Austin, Texas. The actual date of the meeting will be announced as soon as possible.

Oregon Section

The following officers and directors have been elected to serve the Oregon Section, ACSM, for the year beginning November 1, 1959:

Chairman—Francis E. Waggoner, Eugene,
Vice Chairman—Alan C. Givens, Portland,
Secretary-Treasurer—Claire E. Pense, Portland,
Editor—Hal P. Barrows, Hillsboro, and
Directors—A. D. Graham, Salem, and Glenn E. Tyler, Lakeview.

Four members of the Oregon Section attended the 1959 Western Regional Meeting at Los Angeles late in October. Despite illness and disaster directly affecting some of the officers of the Oregon Section, which slowed up Section activity somewhat during 1959, one meeting was held in Portland with a good attendance.

Arizona Section

Following its rather modest inception by a dozen members, an organizational meeting was held in Tucson on November 12, 1958, with George C. Bestor, then Vice President of the ACSM, presiding. The Arizona Section Charter was issued December 8, 1958, with 56 charter members. Under the able guidance of Chairman C. E. Way in 1959 the Section has grown until it now has 92 nationally affiliated members.

At the meeting held November 20, 1959, in Tucson, new officers and directors were chosen for the coming year, as follows:

Chairman—James D. King,
First Vice Chairman—Robert L. Frazer,
Second Vice Chairman—Clyde L. Armstrong,
Third Vice Chairman—E. H. Jenkins,
Secretary—Philip B. Newlin,
Treasurer—John Bagshaw, and
Directors—C. E. Way, J. B. Holmquist, H. T. Pearson, and William Wheeler.

It was decided that the best interests of the organization would be served by holding meetings in Tucson for the southern group of members, under the chairmanship of Robert L. Frazer, while the northern group of members meet in Phoenix, with James D. King presiding. Joint bimonthly meetings are to be scheduled in alternate areas.

—James J. Walden
Section Editor

Texas Section

Chairman Tom Dillon presided as the Texas Section, ACSM, held its annual meeting with its first "Ladies Night" at the Golden Drumstick on Richmond Road, Houston, Texas, Thursday, December 17, 1959. Some eighty members and guests attended. (Opinion is that more Ladies Nights will be held in 1960.)

After the dinner, reports were made, and a summation of the activities of the past year was given by Chairman Dillon. Perhaps the most noteworthy single item was the acceptance of the Texas Surveyors Association as an affiliate of ACSM.

Election of officers and directors for 1960 was announced, as follows:

Chairman—Joe A. Hicks, Jr.,
First Vice Chairman—Glenn E. Musselman,
Second Vice Chairman—Howard E. Bush, Jr.,
Third Vice Chairman—John H. Brownlee,
Secretary—Earl E. Isaacks,
Treasurer—Mario Lozano, and
Directors—Roy C. Brown, Paul A. Lederer, and Howard C. Taylor. Holdover and automatic directors are Tom Dillon, B. D. King, Jr., and James W. Terry.

Incoming Chairman, Joe A. Hicks, Jr., spoke briefly and called for a rising vote of thanks to retiring Chairman Dillon.

The meeting then adjourned.

—G. E. MUSSELMAN
Section Editor

ACSM Election Results

The balloting for officers and directors of the American Congress of Surveying and Mapping has resulted in the election of the following, to serve as indicated for the 1960–1961 period—annual meeting to annual meeting.

President—Rear Admiral H. Arnold Karo, and

Vice President—Brother B. Austin Barry.

The following were elected as Directors for the two year period 1960–1962:

Ralph Moore Berry,
Duncan M. Fitchet,
Victor H. Ghent,
Roland H. Moore, and
Alfred O. Quinn.

Personals

Frederick J. Doyle, formerly with Ohio State University as an associate professor of photogrammetry and chairman of the Division of Geodetic Science, has been appointed to the Washington, D. C., staff of Broadview Research Corporation and will direct photogrammetric and geodetic research in the Intelligence Systems Division of that organization.

Page 8 of the December 1959 issue of *P. G. and E. Progress* shows some interior views of the "model house" for Carmel Knolls, a 91-home project in a subdivision on the north side of Carmel Valley, one of Past President **George C. Bestor's** recent subdivision projects.

L. L. Funk, formerly Photogrammetric Engineer, has been promoted to Planning Engineer, Division of Highways, California Department of Public Works.

ACSM Past President **Carroll F. Merriam,** now retired and living at Prospect Harbor, Maine, was the subject of a "30-inch" story by Franklin P. Lincoln, in the *Portland (Me.) Press Herald* of November 18, 1959. This interesting account of Mr. Merriam's doings appeared under the title "He Finds Maine Has Something More Valuable Than Scenery." It appears that Mr. Merriam is keeping himself busy by using his "peninsula" as a proving ground to test the effectiveness of surveys tied to the State coordinate system through the USC&GS geodetic control stations. We hope that one of these days he will put his findings in the form of an article for publication in this Journal.

Marsh W. Bull has been appointed Western Regional Sales Manager for Keuffel & Esser Co., and will supervise sales activity of all K&E branches and distributors in all western States and western Canada.

James W. Robinson, 1960 Vice Chairman of the Southern California Section, ACSM, has been promoted to chief title engineer of the Title Insurance and Trust Co., Los Angeles. Robinson is a licensed land surveyor and has been with the title firm since 1946.

William H. Meyer has been appointed Vice President of American Air Surveys, Inc., Photogrammetric Engineers, of Manhasset, N.Y., and Pittsburgh, Pa.

Robert G. Betts has been elected president of W. & L. E. Gurley of Troy, N.Y. He is a grandson of Lewis E. Gurley, one of the founders of the firm, and is the sixth president to serve the company in its 115-year history. **Lester C. Higbee,** president of the company for the past eight years, has been named vice chairman of the board, and has been reelected president of Precision Instruments, Inc., a wholly-owned Gurley subsidiary. **M. Scott Dickson** was reelected vice president of the Gurley company and **Daniel Harkness** continues as secretary.

Benjamin L. Page has been appointed Chief of the Length Section, Optics and Metrology Division, of the National Bureau of Standards. Mr. Page has been serving as acting chief since March 1959, when Dr. **Lewis V. Judson** transferred to the Bureau's Office of Weights and Measures in order to concentrate on authorship and other scientific work.

PARK AERIAL SURVEYS, INC.

Est. 1920

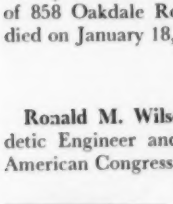
AERIAL PHOTOGRAPHIC & TOPOGRAPHIC SURVEYS

STANDIFORD FIELD LOUISVILLE, KY.

Deaths

Professor **Ralph P. Black,** formerly on the faculty of the Georgia Institute of Technology, of 858 Oakdale Road, N.E., Atlanta, Georgia, died on January 18, 1960, at the age of 79 years.

Ronald M. Wilson, Geological Survey Geodetic Engineer and a charter member of the American Congress on Surveying and Mapping, died November 28, at his home in Bethesda, Md., after a long illness.



Mr. Wilson was born in Quincy, Mass., in 1891. Upon graduating from the Massachusetts Institute of Technology, he joined the Geological Survey in 1914. His experience in topographic mapping began in the Pacific Coast mountains and continued with surveys in Alaska, and with the original mapping of the Hawaiian Islands. While in Hawaii he assisted with the work of the volcano observatory at the rim of Kilauea Crater and carried out surveys in the leper colony on the Island of Molokai. He also helped to design seismographs that were installed at Hilo and at Kealakekua.

In the 1930's he designed the first precise photoalidade, one of the devices which made the trimetrogon system of mapping practical. Patented in 1941, the Wilson photoalidade was used widely in World War II for Air Force reconnaissance mapping.

In 1933 Mr. Wilson was appointed chief of the Geological Survey's computing section, where he aided in making the Topographic Division the first surveying organization to use electric calculators in computing transit traverse and triangulation surveys. In 1946 he was appointed Chief, Geodesy and Control Surveys Section, Research and Technical Control Branch, of the Topographic Division, a position he held until his retirement on October 31, 1956.

On April 23, 1957, in recognition of his many valuable contributions to the science of surveying, the Department of the Interior granted Mr. Wilson its highest honor, the Distinguished Service Award.

His affiliations included the American Society of Civil Engineers, American Society of Photogrammetry, American Geophysical Union, Society of American Military Engineers, Canadian Institute of Surveying, Washington Society of Engineers. Washington Society of MIT, and the Washington Academy of Sciences, as well as the American Congress on Surveying and Mapping.

Rare Book

The following note is quoted from *Przeglad Geodezyjny,* 1959 Nr 8–9, Rok XXXI, the special August issue of the journal of the Polish surveyors. —EDITOR

The anonymous book, "Geometria Peregrinans," of which now only three copies exist, was written by the Polish surveyor, cartographer, and poet Matthias Gloskowski (Gloscovius), who between 1636 and 1641 was the tutor to the Prince William II of Orange (1625–1650). In Poland he was a surveyor of the county of Kalisz. The book contains 21 problems about the measurment of inaccessible distances: 16 of these problems were later resolved by the Netherlandese mathematician Francis van Schooten the younger (1615–1660).

New Manual

The City of Los Angeles, Board of Public Works, Bureau of Engineering has published "Standard Practice Instructions for Survey Division." This booklet comprises 88 pages and 42 plates, and may be obtained by writing to City of Los Angeles, Bureau of Engineering, Room 260, City Hall, Los Angeles 12, California, and enclosing a remittance in the amount of $2.33, to cover the cost of the manual, tax, and postage. Sixty of these books were sold at the ACSM Western Regional Conference last October. —ROBERT B. IRWIN

CUSTOM
ELECTRONIC DISTANCE MEASURING

Model Four Geodimeter

James D. Carter
2148 Dena Dr. — Concord — California MU 2-2678

Accurate — Rapid — Reliable
10,000 Miles of Experience

NEW MEMBERS

ADAMS, Elton E., 1813 Taylor St., Wichita Falls, Tex.—Paving Inspector, City of Wichita Falls

ADWELL, James V., 2209 Madeira Drive, N.E., Albuquerque, N. Mex.—Chief of Survey Party, Ross-Beyer Engineering Co.

AHRENS, William L., Route 1, Box 134, Imperial, Mo.—Foreman, A. C. I. C.

ALLEN, James M., 516 N. 23rd St., La Crosse, Wis.—Engineer and Surveyor

AMATETTI, S. G., 81 Willoughby St., Brooklyn, N. Y.—Surveyor, Bartlett, Ludlam, Dill & Co.

ARNOLD, John F., 135 Selman Drive, Monroe, La.—Surveyor, S. E. Huey & Co.

BABBERGER, Carl, P. O. Box 286, Canon City, Colo.—Consultation and Surveying, Paragon Services

BAILEY, Fred W., Jr., 4046 Devon St., Corpus Christie, Tex.

BAJER, Tadeusz Karol, 3255 W. Broadway, Vancouver 8, B. C., Canada—Computer, B. C. Engineering Co.

BARBER, Mark E., 144 W. Colfax St., Denver 2, Colo.—Engineer, Denver Board of Water Commissioners

BARNARD, W. H., St. Regis Paper Co., Kraft Center, Pensacola, Fla.

BENNETT, E. L., Courthouse Annex, Box 1414, Sterling, Colo.—County Surveyor, Logan County

BERG, Henry L., 3437-A Winnebago St., St. Louis, Mo.—Party Chief, Harrison Engineering and Surveying Co.

BERGSTROM, Bjorn R., 2014 Cambridge Place, South Pasadena, Calif.—Surveyor, Los Angeles County Road Dept.

BLAIR, Wilbert F., 5374 Granville Court, Fremont, Calif.

BONURA, C. J., Harelson Switching Station, Route 2, Box 421, Baton Rouge, La.—Party Chief, Gulf States Utilities Co.

BORNSTEIN, Edward, 18 MacArthur Blvd., Danvers, Mass.—Land Surveyor, Raymond C. Pressey, Inc.

BROWN, Robert J., Box 86, Port Lavaca, Tex.—Civil Engineer, Collins Construction Co.

BUCKNER, John O., City Hall, Colorado Springs, Colo.—Surveyor, City of Colorado Springs

BURNS, Robert F., 1861 Sunset Lane, Columbus, Nebr.—Resident Engineer, Reed & Wurdeman

BUSH, Charles R., Jr., 810 Dogwood St., Washington 12, D. C.—U. S. C. & G. S.

CARTER, Gilbert B., 113 E. Franklin Ave., El Paso, Tex.—President, Carter Engineering Co.

CHANCE, Curtis F., P. O. Box 1187, Conroe, Tex.—Party Chief, J. Waddill Engineering Co.

CHEE-A-TOW, Leonard Vernon, Shirley Park Ave., P. O. Box 1219, Nassau, Bahamas

COLE, James W., 1857 Wade Ave., Santa Clara, Calif.

COLE, William R., 823 W. Connally St., Tyler, Tex.—Party Chief, Harry L. Johnson

CONSTANS, Robert E., 2711 S. E. 154th St., Portland 36, Oreg.—Chief, Cartographic Section, Oregon State Office, Bureau of Land Management

CORNELL, Carl M., Buffalo, S. Dak.—Land Surveyor

COWAN, Donald, P. O. Box 83, Arvada, Colo.—Civil Engineer and Surveyor

COX, John L., 233 Merchant St., Honolulu 13, Hawaii

COX, Kenneth W., 2 Woodland Drive, Orono, Me.—Chief Photogrammetrist, James W. Sewall Co.

CRAWFORD, Marshall K., 511 Pinbrook Road, Lafayette, La.—Party Chief, John E. Chance, Civil Engineer

DALE, Lee, 1501 Edith Lane, Colorado Springs, Colo.—Party Chief, R. Keith Hook & Associates

DAVIS, Marvin, 1625 Mariposa St., Lodi, Calif.—Assistant Engineer, City of Lodi

DAY, Arthur L. 225 Malaga Ave., Coral Gables, Fla.—Civil Engineer, General Development Corp.

DILLON, Hugh, State House, Lincoln, Nebr.—Nebraska State Surveyor

DONALDSON, Max A., 704 N. "G" St., Porterville, Calif.—Civil Engineer, Stetson, Strauss & Dresselhaus, Inc.

DOWDY, James M., 253 E. Kanawha Ave., Columbus 14, Ohio—Research Engineer, North American Aviation, Inc.

DRURY, Dewitt C., 495 Sixth Ave., New York 11, N. Y.—Supervisor, Bartlett, Ludlam, Dill & Co.

EARLEY, Justin, 578 W. Marion St., Mt. Gilead, Ohio—Engineer, Shaffer, Parrett & Associates

EASON, Leo W., II, 304 State Ave., Olympia, Wash.—Civil Engineer, Washington Department of Highways

EHRINGER, Gerald H., P. O. Box 507, Albemarle, N. C.—Consulting Engineer

ENOS, John J., 851 Monticello Drive, Falls Church, Va.—Cartographer, U. S. G. S.

ERICKSON, Michael A., P. O. Box 1101, Globe, Ariz.—Transitman, Hammes Engineering Co.

EVERETT, Lyle B., 313½ Mendocino Ave., Santa Rosa, Calif.

FALK, Robert, 322 Belva Way, El Paso, Tex.—Engineering Supervisor, El Paso Natural Gas Co.

FANOUS, Fahim, Anglo-Egyptian Oilfields, Ltd., Shell House, Midan Orabi, Cairo, Egypt, UAR—Senior Surveyor

FINKLANG, John W., 10239 Green Valley Drive, St. Louis 36, Mo.—Cartographer, U. S. A. F.

FISHER, Robert R., P. O. Box 164, Sedalia, Colo.—Surveyor, Fisher Engineering Service

FOGAROSI, Charles J., 1231 Lehigh Parkway, South, Allentown, Pa.

FREEMAN, Atwood M., P. O. Box 398, Brunswick, Ga.—Surveyor, Delta Surveyors

GARBER, Marvin L., 922 Trust Bldg., Lincoln 8, Nebr.—Partner, Fulton & Cramer Co.

GEICK, Robert J., 3631 W. 45th Ave., Denver 21, Colo.—Cartographic Aid, U. S. Forest Service

GEORGE, Sebastian P., 1723 Mary Hubert Court, St. Louis 25, Mo.—Cartographer, A. C. I. C.

GEORGI, Charles O., Charles O. Georgi Co., 2215 W. County Road B, St. Paul, Minn.—Civil Engineer and Land Surveyor

GIDEON, Maxmilian Cedric, 4276-C Bukit Bahru, Malacca, Federation of Malaya—Land Surveying and Mapping

GOUDIE, Gavin M., Jr., 6057 Flower St., Arvada, Colo.—Assistant Chief Engineer, Tipton & Kalmbach

GOYEA, Elmer E. 8921 Ione Lane, Affton 23, Mo.—Cartographer, A. C. I. C.

GREEN, Frank J., Court House, Kearney, Nebr.—Buffalo County Surveyor

HALLENBECK, Prof. Charles V., Jr., Room 15, Engr. 1, University of Colorado, Boulder, Colo.—Assistant Professor, Civil Engineering

HAMLIN, G. H., Aero Service Corp., 120 E. Luray St., Philadelphia, Pa.

HARDING, James W., 1933 Norfolk St., Houston 6, Tex.—Surveyor and Engineer, Texas & New Orleans R. R. Co.

HARRIS, Jerry R., P. O. Box 2164, Anchorage, Alaska—Supervisory Cadastral Surveyor, Bureau of Land Management

HIGDON, William, 3201 Herrick St., Flint 3, Mich.—Student, University of Michigan

HILL, E. O., P. O. Box 251, Woodville, Tex.—Surveyor

HUGG, Harlan H., 5102 Timberwolf St., El Paso, Tex.—Assistant to President, El Paso National Bank

HUGHES, LaVerne E., 1417 Sioux St., Lincoln 2, Nebr.—Land Surveyor, Office of County Surveyor

IRWIN, Thomas E., 113 W. 9th St., Leadville, Colo. —Acting County Surveyor and County Treasurer

JACKSON, James M., 44 N. Parsell St., Mesa, Ariz. —Land Surveyor

JACKSON, Robert A., 16 Carlile Place, Pueblo, Colo. —Surveyor and Engineer, Colorado Fuel and Iron Corp.

JENTSCH, Harry G., P. O. Box 12104, Tucson, Ariz. —Draftsman, Maddock & Associates

JOHNSON, Harry L., 402 Citizens First National Bank Bldg., Tyler, Tex.—Surveyor and Engineer

JOHNSON, Ralph F., c/o Sitts & Hill, 2901 S. 40th St., Tacoma 9, Wash.—Land Surveyor

JONES, Robert H., 218 Spencer St., Garden City, Kans.—Engineer

JOSEY, John D., Jr., 1000 Birch St., Grants, N. Mex.—Engineer and Surveyor, Grants Engineering Co.

JUMP, Joe R., 22140 Costanso St., Woodland Hills, Calif.—Surveyor, Aerial Control, Inc.

KHALISY, Fawzy, 2024-C Northwood Apts., Ann Arbor, Mich.

KIRCHHERR, Dr. Engene C., Assistant Professor of Geography and Geology, Western Michigan University, Kalamazoo, Mich.

KROGER, Warren F., 312 N. Capitol Way, Olympia, Wash.—Land Surveyor, Thurmond-Kroger & Associates

KWON, Hwang In, Director, The Geographical Research Institute, Ministry of National Defense, Seoul, Korea

LARSON, Roger H., 232 E. 43rd St., San Bernardino, Calif.—Supervisor, Division of Highways, California

LATHAM, John T., 36 Boone Trail, Severna Park, Md.

LESSER, Burton S., 6847 Cleveland Ave., Westerville, Ohio—Photogrammetry Engineer, Photronix, Inc.

LIND, Willis H., County Court House, Fremont, Nebr.—County Surveyor

LIPPINCOTT, Lester Emmert, City Hall, Santa Rosa, Calif.—Assistant City Engineer, City of Santa Rosa

LITTLE, Paul F., 2309 St. Francis Ave., Joliet, Ill. —Civil Engineer, Charles W. Cole & Sons

LOVING, Hugh B., 115 Bisvey Drive, Falls Church, Va.—U. S. G. S.

LUDICKE, Rex, c/o Pure Oil Co., 1700 Broadway, Room 401, Denver 2, Colo.—Division Civil Engineer

LUNDEN, Jack, Box 3008, Eastchester Branch Anchorage, Alaska— R. W. Retherford Associates

MACKAY, Donald G., 347 Commercial St., San Jose, Calif.

MAHLER, Raydean E., 4710 Robertson Ave., Carmichael, Calif.—Surveyors' Service Co.

MAHONEY, Harry E., 5086 Stuart St., Denver 12, Colo.—Cartographic Aid, U. S. Forest Service

MANN, Franklin M., 3008 Second St., North, Arlington 1, Va.—U. S. G. S.

MANN, Lester S., 1305 N. Central Ave., Phoenix, Ariz.—Cadastral Engineer

MARK, Jack, 17 Legend Lane, Westbury, L. I., N. Y.—Draftsman-Cartographer, Federal Aviation Agency

MATHER, Orville K., P. O. Box 1242, Albuquerque, N. Mex.—Draftsman-Surveyor, Ross-Beyer Engineering Co.

McADAMS, S. L., P. O. Box 442, Huntsville, Tex.— Surveyor, Walker Co.

McGUIRT, J. D., Box 1147, O. C. S., Lafayette, La. —Civil Engineer, Tidewater Oil Co.

McINTOSH, John E., 429 Pine St., Lockport, N. Y. —John E. McIntosh Associates

McCRAE, Donald, 81 Willoughby St., Brooklyn, N. Y.—Partner, Bartlett, Ludlam, Dill & Co.

MEAGHER, Thomas F., Jr., 6152 S. Laverne St., New Orleans, La.—Draftsman, Tennessee Gas & Oil Co.

MEEKS, Bennis W., P. O. Box 815, Center, Tex.

MEHN, Daniel J., Department of Civil Engineering, Tulane University, New Orleans 18, La.

MESSINGER, Robert L., 10434 Monarch Drive, St. Louis 36, Mo.—Supervisory Cartographer, A. C. I. C.

METCALFE, Marlton O., 1710 Eva St., Route 2, Box 759, Austin, Tex.—Surveyor

MOAK, David C., 601 W. Cheryl Ave., Hurst, Tex. —Surveyor

MOORE, Edward C., 205 N. Cherry St., Hammond, La.—Surveyor

MOORE, W. L., P. O. Box 792, Cisco, Tex.—Surveyor

NAKAHATA, Tadaka, Room 15, 1507 Kapiolani Blvd., Honolulu 14, Hawaii—Nakahata, Kaneshigem, Imata & Associates, Ltd.

NELSON, Albert C., 250 N. E. 51st St., Miami, Fla. —Surveyor and Land Planning, Gerber, Pancani & Crowder

NEWMAN, J. S., P. O. Box 651, Sinton, Tex.—Surveyor

O'BRIEN, Andrew J., 1619 W. Elm St., Lodi, Calif. —Assistant Highway Engineer, State of California

OH, Ilyong, 128 Andrew Place, West Lafayette, Ind. —Student, Purdue University

PERKINS, Dana R., 376 Washington St., Gloucester, Mass.—Land Surveyor

PETERSEN, Victor M., 1370 31st Ave., Columbus, Nebr.—Surveyor, Raymond H. Reed, Wurdeman and Associates

POPE, Frederick T., 1811 Old Shell Road, Mobile, Ala.—Civil Engineer, Corps of Engineers, U. S. Army

PRICE, G. C., P. O. Box 194, Bernalillo, N. Mex.— Engineer and Surveyor

PRIESTAF, Robert C., Mark Hurd Aerial Surveys, Inc., P. O. Box 488, Goleta, Calif.—Chief Photogrammetrist

QUINN, William F., 502 W. 8th St., Palisade, Colo. —Surveyor, Western Engineers

RAMEY, Paul, 3203 W. Pima St., Phoenix, Ariz.— Chief of Party, Holmquist Engineers

RATCHFORD, Homer A., P. O. Box 840, Wichita Falls, Tex.—Division Engineer

RAU, George J., P. O. Box 3, Mendocino, Calif.— Forest Engineer, Union Lumber Co.

REEKIE, George F., Grove St., Norwell, Mass.— Land Surveyor

REINEKE, John J., 3324 N. 57th St., Omaha 4, Nebr.—Surveyor

RILEY, Henry Lawrence, 318 Stanford Drive, Albuquerque, N. Mex.—Consulting Geologist

RINEHART, Kenneth W., Inter American Geodetic Survey, c/o U. S. Embassy, Lima, Peru—Project Engineer

ROBERTS, E. N., 27 N. Main St., Concord, N. H.

ROBINETT, M. E., Route 3, Box 461, Greeley, Colo. —Senior Draftsman

ROBINSON, T. B., P. O. Box 8405, Kansas City 14, Mo.—Partner, Black & Veatch

ROBUCK, Richard D., 105 E. Dengar Ave., Midland, Tex.—District Civil Engineer, Mobil Oil Co.

ROSS, Rodney D., P. O. Box 161, Vernal, Utah— Partner, Ross Construction Co.

ST. JOHN, Harold E., 32 Berkeley Ave., Newport, R. I.—Surveyor

SALAMONE, Dante A., 87 Chard St., East Weymouth 89, Mass.—Civil Engineer and Land Surveyor

SAYERS, Robert E., P. O. Box 212, Sturgis, Mich. —Surveyor

SCHILLINGER, Robert L., 8718 Ruthelen St., Los Angeles 47, Calif.—Student, Pasadena City College

SCHWERTNER, Albert J., P. O. Box 1106, Willcox, Ariz.—Surveyor

SCOTT, J. W., 124 Madison Ave., Yuma, Ariz.— Surveyor

SERAFINI, E. Max, Meurer-Serafini-Meurer, 1815 Federal Blvd., Denver 4, Colo.—Surveyor and Engineer

SERVER, George Leon, 516 Rose Drive, Colorado Springs, Colo.—Project Engineer, Sproul Land Co.

SHACKLETTE, Paul H., P. O. Box 42, Gamboa, Canal Zone — Cartographic Engineer, Panama Canal Co.

SHAFFER, Olin L., City Hall, Greeley, Colo.—Director of Water and Sewers

SHAMBURGER, Roy T., P. O. Box 648, Lubbock, Tex.—Party Chief, Sun Oil Co.

SMITH, Egbert V., 3316 Big Bend Drive, Austin 3, Tex.—Texas General Land Office

SMITH, O. T., P. O. Box 2991, Globe, Ariz.—Surveyor, Hammes Engineering Co.

SPERRY, John H., 126½ Pine Ave., Albany, Ga.—Civil Engineer and Land Surveyor

STAHLA, August, P. O. Box 323, Kimball, Nebr.—Kimball County Surveyor

STEPHENSON, Thomas J., 108 Mill St., Colorado Springs, Colo.—Chief Surveyor, United Western Engineers

STOBEL, Harold, 829 Morning Glory St., West Sacramento, Calif.—Packard, Muir & Train, Inc.

SWEET, Jay, 3530 S. Market St., Salt Lake City 4, Utah—Part Owner, Geotech, Land Surveyors

TALLEY, Donald F., Mann-Talley, Inc., 820 West St., Wilmington, Del.—Engineer and Land Surveyor

THAETE, Eldor W., 122 N. Seventh St., Colorado Springs, Colo.—Surveyor

THOMPSON, Francis P., 13506 Elm St., Lenexa, Kans.—Party Chief, Shafer & Kline

TODD, Clinton A., 601 W. 57th St., Topeka, Kans.—Chief of Party, Allied Engineering Co.

TOMME, Harold E., Jr., Sinclair Pipe Line Co., 901 Fair Bldg., Fort Worth 2, Tex.—Senior Civil Engineer

VOGEL, Ed J., Gulf States Utilities Co., Liberty Ave., Beaumont, Tex.—Party Chief and Supervisor

WALKER, Clarence, 41981 Miranda St., Irvington, Calif.—Assistant Chief Engineer

WALLACE, Alfred D., California Water & Telephone Co., 386 Third Ave., Chula Vista, Calif.—Chief of Party

WALLACE, Ronald L., California Water & Telephone Co., 386 Third Ave., Chula Vista, Calif.—Field Engineer

WEST, John W., 412 N. Dal Paso St., Hobbs, N. Mex.—Engineer and Surveyor, John West Engineering Co.

WETZEL, Vernon F., P. O. Box 2880, Dallas 21, Tex.—Engineer, Sun Oil Co.

WHITAKER, Adrian E., Harelson Switching Station, Route 2, Box 421, Baton Rouge, La.—Party Chief

WICKLUND, Duane A., U. S. Geological Survey, Box 133, Rolla, Mo.—Cartographer

WILKINSON, Thomas E., 228 N. Fairmont St., Lodi, Calif.—Civil Engineer, San Joaquin County

WILLIAMS, Ray R., P. O. Box 537, Gibbon, Nebr.—Assistant to Surveyor, Buffalo County

WILSON, Kent L., Box 133, Rolla, Mo.—Cartographer, U. S. G. S.

WITCRAFT, Chauncey B., Jr., P. O. Box 114, Pawhuska, Okla.—Surveyor, Osage Surveying Service

WOODS, Charles F., 74 Harris Ave., Lowell, Mass.—Engineer and Land Surveyor

GEOGRAPHICAL DISTRIBUTION OF NEW MEMBERS LISTED ABOVE

Alabama	1	Illinois	1	Missouri	9	South Carolina	1
Alaska	2	Indiana	1	Nebraska	10	South Dakota	1
Arizona	8	Kansas	3	New Hampshire	1	Texas	22
California	19	Kentucky	1	New Mexico	6	Utah	2
Colorado	21	Lousiana	7	New York	5	Virginia	3
Delaware	1	Maine	1	North Carolina	1	Washington	3
District of Columbia	1	Maryland	1	Ohio	3	Wisconsin	1
Florida	3	Massachusetts	4	Oklahoma	1	Total	156
Georgia	2	Michigan	4	Oregon	1	Foreign	10
Hawaii	2	Minnesota	1	Pennsylvania	2	Total	166

Woods Hole Oceanographic Institution to Have a New Research Vessel

The Research Vessel *Atlantis,* the 28-year-old "flagship" of the Woods Hole Oceanographic Institution, will be replaced by a more modern oceanographic research vessel as a result of a $3 million grant from the National Science Foundation.

The new vessel will have a length of 175 feet, a beam of 36 feet, a displacement of 1040 tons, a cruising speed of 12 knots, and an operating range of 7,500 miles. Her complement will be 37, and 19 of these will be scientists. The new vessel will be used in both the North and South Atlantic Oceans, where most of the Woods Hole research investigations are concentrated.

"Half-inch" Map of Great Britain

The Ordnance Survey of Great Britian has begun work on a series of sheets to cover Great Britain at the scale of one-half inch to the mile. Each sheet of this 51-sheet series will cover approximately 3,000 square miles—50 miles east and west by 60 miles north and south. The contour interval is 100 feet, and the relief is further emphasized by the use of a green tint up to 200 feet and graded tones of buff, changing each 500 feet, for the higher elevations. The first sheet (No. 36) appeared in December 1958. These maps, as they are completed, will be published in three formats: Paper, flat; paper, folded, in covers; and mounted, folded in covers. These maps are expected to be particularly useful to motorists, cyclists, and hikers, and they may be combined to make up maps of counties or regions.

Annual Financial Statement

(As of December 31, 1959)

INCOME

Dues and memberships received	*1958*	*1959*	*Year ending 12/31/58*	*Year ending 12/31/59*	*Difference*
Individual	4920	5276	$24,791.52	$26,645.40	+ $1,853.88
Library and sustaining	772	717	4,070.49	4,168.26	+ 97.77
Previous years dues			80.00	98.00	+ 18.00
Total	5692	5993	28,942.01	30,911.66	+ 1,969.65
Publication sales			179.87	444.79	+ 264.92
Advertising			5,360.42	6,625.73	+ 1,265.31
Other income			1,878.99	1,924.66	+ 45.67
Annual meeting			6,302.41	5,301.69	– *1,000.72*
OPERATING INCOME			$42,663.70	$45,208.53	+ $2,544.83

EXPENDITURES

Journal	$18,306.19	$20,522.23	+ $2,216.04
Salaries, office expenses, etc.	13,243.78	15,926.58	+ 2,682.80
Travel	586.77	1,279.88	+ 693.11
Technical divisions	2,152.81	2,321.66	+ 168.85
Other authorized expenditures	39.03	282.25	+ 243.22
TOTAL EXPENDITURES	$34,328.58	$40,332.60	+ $6,004.02
NET INCOME	$ 8,335.12	$ 4,875.93	– *$3,459.19*

ASSETS

Bank balance	$12,662.10	$18,865.35	+ $6,203.25
Bonds and savings accounts	60,385.34	62,232.19	+ 1,846.85
Property	3,362.41	4,545.71	+ 1,183.30
Advance payments	379.53	857.61	+ 478.08
Accounts receivable	1,385.67	1,597.93	+ 212.26
TOTAL ASSETS	$78,175.05	$88,098.79	+ $9,923.74

LIABILITIES AND NET WORTH

Advance dues paid	$11,285.15	$11,674.00	+ $ 388.85
Accounts payable		4,658.96	+ 4,658.96
TOTAL LIABILITIES	$11,285.15	$16,332.96	+ $5,047.81
NET WORTH	$66,889.90	$71,765.83	+ $4,875.93

JOHN M. AMSTADT, *Chairman*
Budget and Finance

CONGRESS DIRECTORY

EXECUTIVE OFFICERS

PRESIDENT: Rear Admiral H. Arnold Karo, Coast and Geodetic Survey, Washington 25, D. C.

VICE PRESIDENT: Brother B. Austin Barry, Civil Engineering Department, Manhattan College, New York 71, N. Y.

EXECUTIVE SECRETARY: Walter S. Dix, 435 Woodward Bldg., c/o TVA, Washington 5, D. C.

TREASURER: Capt. H. W. Hemple, c/o American Congress on Surveying and Mapping, 905 Washington Bldg., 1435 G St., N.W., Washington 5, D. C.

EDITOR: Howard S. Rappleye, 6712 Fourth St., N.W., Washington 12, D. C.

STANDING COMMITTEE CHAIRMEN

BUDGET: John M. Amstadt, 5350 2nd St. North, Arlington, Va.

CONSTITUTION: Walter S. Dix (Acting), 435 Woodward Bldg., c/o TVA, Washington 5, D. C.

MEMBERSHIP: Capt. Frank S. Borden, 905 Washington Bldg., 1435 G St., N.W., Washington 5, D. C.

PROFESSIONAL STATUS: Lester C. Higbee, W. & L. E. Gurley, Troy, N. Y.

PUBLIC RELATIONS: Helmuth Bay, 1104 National Press Bldg., Washington 4, D. C.

PUBLICATIONS: Charles A. Whitten, Coast and Geodetic Survey, Washington 25, D. C.

TWENTIETH ANNUAL MEETING: Granville K. Emminizer, Room 3800, Coast and Geodetic Survey, Washington 25, D. C.

DIVISION CHAIRMEN

CARTOGRAPHY: Granville K. Emminizer, Room 3800 U. S. Coast and Geodetic Survey, Washington 25, D. C.

CONTROL SURVEYS: Richard G. Watts, Magnolia Petroleum Co., P. O. Box 900, Dallas 1, Texas.

EDUCATION: Prof. Francis H. Moffitt, Dept. of Civil Engineering, Univ. of California, Berkeley 4, Calif.

INSTRUMENTS: Clifford A. Thorpe, Jr., 501 Woodlawn Ave., Falls Church, Va.

PROPERTY SURVEYS: A. Phillips Bill, 289 Main St., South Deerfield, Mass.

TOPOGRAPHY: Charles W. Buckey, Topographic Division, U. S. Geological Survey, Washington 25, D. C.

LOCAL SECTION OFFICERS

ARIZONA: James D. King, *Chairman,* Holmquits Engineers, 364 North First Ave., Phoenix, Ariz.

Prof. Phillip B. Newlin, *Secretary,* Civil Engineering Department, University of Arizona, Tucson, Ariz.

COLORADO: Stanley M. Borrell, *Chairman,* Box 1483, Edgewater Br., Denver 15, Colo.

Louis S. Soreide, *Secretary-Treasurer,* 618 Perry St., Denver, Colo.

GREAT LAKES: Prof. Kenneth L. Curtis, *Chairman,* Civil Engineering Dept., Purdue University, Lafayette, Ind.

Dr. George E. Ekblaw, *Secretary,* 216 Natural Resources Bldg., Urbana, Ill.

HAWAII: James M. Dunn, *Chairman,* Hawaii Survey Department, Honolulu, Hawaii

Gilbert K. Minn, *Secretary-Treasurer,* 4050 Kulumanu St., Honolulu 15 Hawaii

LOUISIANA: R. C. Dayton, *Chairman,* P. O. Box 193, New Orleans, La.

H. G. Truelove, *Secretary,* 800 The California Co. Building, New Orleans 12, La.

NEW MEXICO: Robert B. Stephenson, *Chairman,* 9116 Candeleria Road, NE, Albuquerque, N. Mex.

Everett Ross, *Secretary,* Box 418, Albuqurque, N. Mex.

NORTH CAROLINA: Robert P. Guarino, *Chairman,* High Point, N. C.

W. Thompson Cox, *Secretary,* P. O. Box 178, Gastonia, N. C.

NORTHERN CALIFORNIA: Paul Dowling, *Chairman,* 1943 Dowling Court, Santa Rosa, Calif.

Charles E. Randlett, *Secretary-Treasurer,* 61 Renato Court, Redwood City, Calif.

OREGON: Francis E. Waggoner, *Chairman,* Lane County Courthouse, Eugene, Oreg.

Claire E. Pense, *Secretary-Treasurer,* 17021 S.E. Division St., Portland, Oreg.

SOUTHERN CALIFORNIA: A. V. Cocking, *Chairman,* c/o Aerial Control, Inc., 2412 S. Garfield Ave., Monterey Park, Calif.

J. Cooper, *Secretary,* 1346 Yosemite Drive, Los Angeles 41, Calif.

ST. LOUIS: Thomas C. Finnie, *Chairman,* A.C.I.C., Second and Arsenal Sts., St. Louis 18, Mo.

Edward J. Bronczyk, *Secretary*, 8819 Sheryl Ann Dr., Crestwood 26, Mo.

TEXAS: Joe A. Hicks, Jr., *Chairman*, Houston Lighting and Power Co., P. O. Box 1700, Houston 1, Texas.

Earl E. Isaacks, *Secretary*, Houston Lighting and Power Co., P. O. Box 1700, Houston 1, Texas.

UTAH: Bert K. Steiger, *Chairman*, P. O. Box 1076, Salt Lake City, Utah

Clifford G. Bryner, *Secretary-Treasurer*, 2948 Filmore St., Salt Lake City, Utah.

SUSTAINING MEMBERS

ABRAMS INDUSTRIES, (Abrams Aerial Survey Corp., Abrams Instrument Co.), Lansing, Mich.

AERO SERVICE CORP., 236 East Courtland St., Philadelphia, Pa.

C. L. BERGER & SONS, INC., 37 Williams St., Boston, Mass.

EUGENE DIETZGEN CO., Chicago—New York—San Francisco—New Orleans

FILOTECNICA SALMOIRAGHI, INC., 254 Fifth Ave., New York 1, N. Y.

THE GEODIMETER CO., Division of Berg, Hedstrom & Co., Inc., 1170 Broadway, New York 1, N. Y.

GRANT PHOTO PRODUCTS, INC. (Formerly Grant Positype Corporation of America), 18915 Detroit Ave., Cleveland, Ohio.

W. & L. E. GURLEY (4 Memberships), Troy, N. Y.

HILGER & WATTS, LTD., London, England; represented by Eugene Dietzgen Co., and Engis Equipment Co., Chicago, Ill.

INTERNATIONAL AERIAL MAPPING CO., 127 Air-Port Blvd., San Antonio 12, Tex.

KERN & CO., LTD., Aarau, Switzerland; represented by Kern Instruments Inc., 120 Grand St., White Plains, N. Y.

KEUFFEL & ESSER CO., Adams & Third Sts., Hoboken, N. J.

GEO. F. MUTH CO., INC., 1332 New York Avenue, N.W., Washington 5, D. C.

RAND MCNALLY & CO., (2 Memberships), Chicago, Ill.

W. J. ROBBINS & CO., 885 N. LaSalle St., Chicago 10, Ill.

VICTOR O. SCHINNERER & COMPANY, INC., Investment Building, 1511 K Street, N.W., Washington 5, D. C.

R. M. TOWILL CORP., 233 Merchant St., Honolulu 13, T. H.

UNITECH CORPORATION, 50 Colfax Ave., Clifton, N. J.

WILD HEERBRUGG INSTRUMENTS, INC., Main and Covert Sts., Port Washington, N. Y.

ZEISS-AEROTOPOGRAPH, Munich, Germany; represented by Transmares Corporation, 15 William St., New York 5, N. Y., and 929 Highgate Road, Alexandria, Va.

₹ ₹ ₹

A Great Lady Passes

So often has been the case, as history proves, that we have perhaps become quite accustomed to learning that many of the world's great men have been associated at one time or another with the profession of surveying or mapping. The pattern follows, apparently, also to the distaff side.

On February 21, 1960, news reports flashed all over the world telling of the death of Lady Mountbatten and the mourning of Britain's Royal Family for her. The Countess Edwina Mountbatten, aunt of Prince Philip, wife of Admiral Earl Mountbatten the British defense staff chief, died in her sleep while on a Red Cross inspection tour in British North Borneo. Messages from all parts of the world acclaimed this great lady's unselfish devotion to giving help and assistance to mankind, and to her support and leadership in social welfare work. Mention was made of her extensive travels, sometimes alone, often in primitive manner, all over the world.

It is significant, we note, that as reported by Reuters, in earlier years Lady Mountbatten had once signed on as a part of the crew of a copra-trading schooner, manned mostly by natives, for purpose of charting remote South Pacific islands.

WALTER S. DIX

Wild-Heerbrugg Award

The Advisory Council of the American Congress on Surveying and Mapping, having carefully considered an offer from Wild-Heerbrugg Instruments, Inc., to sponsor an annual award to be administered by a special committee of the ACSM, presented the following resolution for consideration by the Board of Direction, ACSM, at its meeting of October 30, 1959, in Los Angeles, California.

RESOLUTION

WHEREAS, Wild-Heerbrugg Instruments, Inc., of Port Washington, New York, having offered to present an award, to be known as *The Wild-Heerbrugg Award,* for noteworthy development for new uses, techniques or instrumentation in the fields of land surveying and/or geodesy, and

WHEREAS, it is the desire of Wild-Heerbrugg Instruments, Inc., that such an award will encourage both practicing surveyors and students in the engineering science or surveying to prepare and present original theories or applications in surveying to the editors of the Journal of the American Congress on Surveying and Mapping for publication in such Journal, and

WHEREAS, Wild-Heerbrugg Instruments, Inc., in order to encourage and stimulate interest, has offered a permanent annual gift of a cash donation of $100.00 for the best article and a donation of $250.00 to the civil engineering or respective surveying department of an educational institution to be chosen by the recipient of the award, and the use of a specially marked T-2 Theodolite-Transit for one year (such instrument to be returned annually to the Wild people for inspection and adjustment, if necessary, before delivery to the following year's recipient), and

WHEREAS, it is the desire of Wild-Heerbrugg Instruments, Inc., that such an award be administered by a separate committee within the ACSM (and it being the suggestion of the ACSM Advisory Council that such a committee be composed of two educators, one member appointed by the Chairman of the Control Surveys Division, one member appointed by the Chairman of the Property Surveys Division, and the Editor of the Journal or his designated representative), and

WHEREAS, the recipients of such award be restricted to members of the American Congress on Surveying and Mapping, now therefore be it

Resolved by the Advisory Council of the ACSM that the Board of Directors be and is hereby requested to approve and adopt the offer and presentation of the herein outlined proposal, and be it further

Resolved that a copy of this Resolution be furnished to Wild-Heerbrugg Instruments, Inc., of Port Washington, New York.

Respectfully submitted,
ADVISORY COUNCIL
(Signed by)
C. C. LINDSAY
W. B. WILLIAMS
WILLIAM C. WATTLES
J. S. BEAZLEY

BOARD ACTION

At the ACSM Board Meeting of October 30, 1959, on motion of W. B. Williams, seconded by R. M. Berry, the following motion carried:

"That as recommended by Advisory Council Resolution subscribed to by C. C. Lindsay, W. B. Williams, William C. Wattles, and J. S. Beasley, and transmitted to the President, Officers and Board of Directors of the American Congress on Surveying and Mapping by letter of August the 19th, 1959, by Jon S. Beasley, Member, ACSM; the offer of the Wild-Heerbrugg Instruments, Inc., of Port Washington, New York, to present *The Wild-Heerbrugg Award* be approved and accepted as proposed."

It was agreed that editorial policy would apply to clarification of the Award in intent and purpose by appropriate modifying phraseology in publicity announcements and similar mention as warranted.

The following excerpt from the letter of January 20, 1960, addressed to Executive Secretary Walter S. Dix by H. P. Tanner, Vice President, Wild-Heerbrugg Instruments, Inc., serves to explain the major departure of the Deed of Award from the terms as set forth in the above Resolution.

"You will note that the terms of the Deed of Award follow the terms of the resolution presented by the Advisory Council very closely with the exception of the fact that Article 3, Paragraph A, does not make it mandatory for students to be student members of A.C.S.M. in order to qualify for the Award. It is our opinion that a relatively small number of students belong to A.C.S.M. Student Chapters since most of them are student members of the local A.S.C.E. Chapters. In proposing this text for the basis of the Award, we deem it advisable to include

as large a number of students [as possible] in the competition since we feel this is in the interest of A.C.S.M."

DEED OF AWARD

WILD HEERBRUGG INSTRUMENTS, INCORPORATED

ARTICLE I—*Name and Purpose*

A. The name of the Award is to be The Wild-Heerbrugg Award.

B. The purpose of the award is to encourage both practicing surveyors and students in the engineering sciences or in surveying to develop news uses, techniques or instrumentation in the fields of land surveying, industrial surveying applications, or geodesy.

ARTICLE II—*Value*

A. The award shall consist of a cash donation of $100.00 and a gift of $250.00 to the Civil Engineering or respective Surveying Department of an educational institution to be named by the recipient of the award. The award winner will furthermore have the use of a specially marked T-2 Theodolite for one year, such instrument to be returned annually to Wild Heerbrugg Instruments, Incorporated, for inspection and adjustment, if necessary, before delivery to the following year's recipient. The award will be made annually.

B. In the case of joint authorship, the prizes shall be divided by the authors. Use of the T-2 Theodolite shall be by mutual consent between the authors.

C. If no award is made in any one year, the cash prizes shall be added to the amounts to be awarded next year.

D. Wild Heerbrugg Instruments, Incorporated, shall provide for the annual prizes to be awarded and shall also underwrite the incidental expenses of providing the recipient with a suitable scroll, and of presenting the award.

ARTICLE III—*Basis of Award*

A. Competition for the award is open to any individual members, or group of members of the American Congress on Surveying and Mapping, and to any student, or group of students in a recognized college or university in the United States. A student must have been registered within the period from January 1st to December 31st of the year of competition.

B. The award shall be made on the basis of papers submitted to the editor of the Journal of the American Congress on Surveying and Mapping for publication in the Journal. Such papers or articles shall describe original theories, research or practices in surveying techniques or instrumentation.

C. The deadline for submission of papers each year shall be January 31st.

ARTICLE IV—*Conditions of School Award*

A. The cash gift to an educational institution of the award winner's choosing (*see* Article II, Paragraph A) shall be appropriated by the department head in charge of surveying for purposes of furthering surveying instruction. The funds shall be used within two years from receipt.

ARTICLE V—*Judges*

A. Papers will be judged, and the award administered, by a committee appointed by the President of the American Congress on Surveying and Mapping. It is suggested that the Control Surveys and the Property Surveys Division as well as the Editorial Staff have representatives on the Committee. Decisions of the Committee shall be final, subject to approval by the Board of Directors.

ARTICLE VI—*Presentation of Award*

A. The presentation of the award shall be made by a member of the Committee during the Annual Meeting of the American Congress on Surveying and Mapping.

ARTICLE VII—*Amendments*

A. If any of the terms of this award become inapplicable to existing conditions, the Donor will consider suggested changes.

ARTICLE VIII—*Term of Award*

A. This award will continue indefinitely, subject to agreement of officers of A.C.S.M. and of Wild Heerbrugg Instruments, Incorporated.

The Organizing Conference of Cartography
Bern, June 9-10, 1959

This meeting of delegates from the national organizations or committees was arranged as a result of the preliminary meeting held in Mainz in November 1958. The purpose was to develop a practical plan for continuing and expanding international exchange in applied cartography and to create the proper organizational vehicle for international cooperation. Until this Bern Meeting, efforts for international cooperation were informally centralized in The Committee of Six. At the Mainz Meeting the delegates from several nations suggested that a Committee

of Three investigate possible affiliation with the International Geographical Union. Professor Eduard Imhof was Chairman of this Subcommittee. Dr. Mannerfelt of Sweden and Dr. Gigas of Germany were the other members. Dr. Imhof made the arrangements for the Bern Conference together with the Landestopographie. This organization made its staff and facilities available for the two-day conference. Delegates from thirteen nations attended the meeting.

OPENING

Director Ernst Huber of the Landestopographie welcomed the delegates. Professor Imhof was elected Chairman.

REPORT OF THE PROVISIONAL COMMITTEE (Investigating affiliation with IGU)

Dr. Imhof sumarized the views of the Provisional Committee concerning the question of independence or affiliation with another organization and explained the several alternatives of action which he had outlined to the delegates before the conference. The three alternatives which he considered were as follows:

Solution A. Foundation of an independent association that would have no affiliation with IGU or other organizations of similar character. Such a group would apply to ICSU (International Council of Scientific Unions) for official recognition. This organization would operate completely independently for its own objectives. This alternative, however, is contrary to the Mainz resolution which stated that a separate international organization should not be founded at the present time.

Solution B. The formation of an international committee or commission on cartography, "The International Cartographic Association" that would later apply for affiliation with the International Geographical Union or some international scientific union in an effort to be accepted with sufficient independence as an autonomous group (this is taken to mean freedom of selection of its representatives and members, its own form of organization and meeting protocol). Until the Bern Meeting this solution had not seemed possible because it would require a change in the statutes of the International Geographical Union. Earlier viewpoints had indicated that the IGU would be hostile to a relationship which might cause other groups to splinter in a similar manner. Otherwise this alternative satisfies the resolutions of Mainz. The proposal must be made to the IGU in 1959 for consideration at the 1960 Stockholm Meeting. It may not be possible, however, to effect statute alteration before 1964 at which time then affiliation on our terms might be possible.

Solution C. Is a compromise viewpoint originally put forth by Hans Boesch. It was his proposal that the cartographers elect a Committee of Six to include a president and five members that would later be approved by the IGU to act as a Subcommittee on Cartography within the present statute framework of the IGU. The name of the chairman would have to be submitted in advance to the IGU before the end of 1959. This special committee could call together additional "corresponding members" for whatever work congresses seem desirable and could operate independently during the periods between Congresses. Some financial assistance by the IGU would be possible.

The present statutes of the International Geographical Union do not provide for permanent commissions. In fact, the purpose of these commissions is that they are temporary in nature.

NATIONAL REPORTS

Professor Imhof then explained his own personal view on the three proposals and revealed the subject of a conference between Dudley Stamp, Hans Ahlmann, and Carl Mannerfelt. Professor Ahlmann was quoted as feeling that cartographers were extremely important to the IGU and that the IGU might in his opinion change its statutes to permit our affiliation. Dr. Imhof then called for reports from the delegates.

United States. Following are excerpts from my comments before the group.

We believe the long-range objective of this group is to establish a lasting and permanent vehicle for exchange and international cooperation. Many feel we should affiliate with an existing organization and the IGU has been mentioned most frequently in this regard. Affiliation with the IGU would bring a certain degree of international acceptance through the ICSU and the UNESCO. It is also said that financial aid from the IGU would be forthcoming if our group had ICSU endorsement. However, we have been told unofficially that this will amount to about $500 every four years.

Despite the lack of demonstrated interest and activity within the IGU in applied cartography, we suggest that it would be to the best advantage for geographers and cartographers to have a greater relationship for their mutual benefit. Affiliation with the IGU in our opin-

ion can be best justified by this higher purpose. There are some problems that would come with membership in the IGU. The first is the problem of STATUS between geographers and cartographers. In some countries the official national delegates are selected by boards of geographers. In some countries the geographers and cartographers are of entirely separate organizations. There would seem to be some question as to whether academic, freelance, commercial, and governmental people would be properly and appropriately represented. Therefore, we believe that our plans must provide for freedom among cartographers to select their own representatives.

Secondly, we are concerned with the PERMANENCE of this organization. The present IGU statutes do not permit a commission to function indefinitely. Our relationship with the IGU, if any, must be more lasting.

Finally, the success of any form of international cooperation is dependent upon the QUALITY OF PARTICIPATION. Through previous conferences we have learned that good results are brought about by active participation by everyone. An open exchange must continue to be the basis for future meetings and the nature of cooperation and the extent of exchange will be only as good as the attitude with which the participants meet their need to give as well as to receive. We suggest that there be some tangible evidence presented to our group by those nations not represented here that they are willing and able to participate fully with the other countries of the group.

Therefore, the cartographers within the United States favor Proposal B as our long-range objective. The organization of an independent commission or committee made up from the respresentatives of each country in attendance here would operate indefinitely or until the desired relationship with the IGU can be achieved. We propose that cartographic organizations in other countries be invited to participate by giving satisfactory evidence of their accomplishments, their purpose, and their ability to contribute.

We propose that this group submit our terms to the IGU for an affiliated organization that they may consider at their International Meeting in Stockholm in 1960.

We also propose that this present group arrange a third technical conference on applied cartography, allowing for participants and observers from member countries on a self-supporting, pay-as-you-go basis.

Great Britain. Brigadier Harris, representing the Royal Society and the British National Committee, stated that they favor Solution B ultimately, but indicated that Solution C might be acceptable.

France. Dr. Gaussen favored Proposal B and if this cannot be achieved by 1960, he then favored Proposal C.

Belgium. Dr. Kormoss was pleased to learn of the new developments that seemed to make Solution B a realistic possibility. His country had rejected Solution C as not taking into account all the interests of the cartographers and was prepared to suggest as another alternative a separate organization in which all countries might participate equally.

Germany. Dr. Siewke presented the German viewpoint as favoring alternative C because alternative B did not seem to be possible, but with the recent developments he stated his preference for this alternative.

Finland. Dr. Kirvesniemi favored Proposal B.

Italy. Colonel Traversi agreed with Belgium.

Netherlands. Dr. Koeman favored Solution B, but also favored the formation of an independent international organization as soon as possible to promote the development of cartography as an independent science.

Norway. Director Gleditsch favored Proposal B.

Austria. Dr. Strzygowski, speaking for the Oesterreichische Geographische Gesellschaft, favored Proposal B.

Sweden. Speaking for the Swedish Cartographic Society, Dr. Mannerfelt, who as an individual has done more than anyone else to foster international cooperation, favored Proposal B. He stated three basic considerations that were the guide for the Swedish point of view.

1. Sooner or later it will be necessary to extend our present informal cooperation to a permanent organization on the international plane.

2. To both the IGU and the cartographers organizational cooperation is desirable.

3. Such cooperation should be arranged in a way that cartography would be completely independent in action as well as in form.

Spain. Professor Maure, speaking for the Spanish Cartographic Society, favored Proposal B, and if this could not be realized by 1960, he shared the French view supporting Proposal C in such an event.

Switzerland. Dr. Chervet agreed with Dr. Kormoss and with Professor Imhof.

ORGANIZATIONAL RESOLUTION

The Committee of Six retired to draft the following resolution:

The delegates to the Bern Meeting resolve to create a *provisional* organization for the purpose of extending international cooperation in the field of cartographic *techniques* and for the purpose of joining with IGU as an affiliated organization with sufficient autonomy.

In discussion, there was opposition to the word "provisional" and to the phrase "cartographic techniques." The word "provisional" was dropped and the word "cartography" was substituted for the words "cartographic techniques." The resolution was passed unanimously.

STATUTES

On the second day of the Meeting, we met to discuss the proposed statutes. It was agreed, first, that the title of the organization would be "Association Cartographique Internationale, A.C.I." and that the French and English languages would be official. The proper English title is "International Cartographic Association." Discussion involved a general review of all of the articles of the statutes. It was proposed by the Committee of Six that Professor Imhof and Stephan de Brommer discuss the articles with Professor Boesch of the International Geographical Union, so that as closely as possible and as desirable, the statutes would be compatible with those of the IGU. It was proposed that each of the delegates to the Bern Meeting should submit their comments to Professor Imhof in Zurich by September 1st to give this group a basis upon which to prepare statutes that may be proposed for final adoption at the next assembly of delegates. Brigadier Harris proposed that in establishing these statutes we should consider the relationships that exist in parallel situations, referring to the statutes of the International Commission for Optics which is affiliated with the International Union of Pure and Applied Physics.

EXECUTIVE COMMITTEE

Dr. Kormoss proposed that the Executive Committee be limited to seven members, a president, secretary-treasurer, and five vice presidents to include a representative from Europe and overseas countries. It also is agreed that this committee should function until the next assembly of delegates in Paris in 1961. Professor Imhof was elected as president. The five vice presidents elected are Mannerfelt, de Brommer, Harris, Fitchet, and Traversi. Dr. Gigas was elected secretary-treasurer.

FRENCH INVITATION

Stephan De Brommer announced the willingness of the French Committee on Cartographic Techniques to organize a conference in Paris. Perhaps the next assembly of delegates meeting could be arranged there. He indicated that it would be difficult to arrange a technical meeting in Paris in the near future. The invitation was not for a technical meeting, for in order to arrange an extensive meeting of this type would require more time and would call for discussion between the French Committee and the French Government.

BELGIAN PROPOSAL

Dr. Kormoss, speaking for Carteurope, explained that their group had been formed to study questions on applied cartography for governmental planning, and that two meetings had been held, the most recent in June 1958. In the past year their own association has been inactive and they face the alternative of proceeding with planning projects or waiting until they might possibly affiliate with this or another group. Dr. Kormoss was thanked for his announcement, and the matter was referred to the Executive Committee for decision.

CARTOGRAPHIC PERIODICAL

Mr. Rudolph Wendorff from Bertelsmann in Gutersloh proposed his idea for the preparation of an annual periodical on cartography which his firm would make, edit, and manufacture based on prior discussion with Professor Imhof. He announced that Imhof would be willing to act as editor in selecting highly competent, technical papers to be reproduced in this annual. Bertelsmann would plan to put the papers in book form in German and would prepare to collaborate with other publishers for distribution in other languages. The assembly of delegates agreed that this matter should be referred to the Executive Committee for action.

The assembly adjourned.

—DUNCAN M. FITCHET

Now Hear This

"Keep It Clean!" is a six-page, gate-fold bulletin describing materials to help draftsmen clean and protect drawings. Copies may be obtained by writing to Keuffel & Esser Co., Adams and Third Streets, Hoboken, N. J.

Dead-weight machines of 300,000 and

1,000,000 pounds capacity have been designed for the National Bureau of Standards' new location at Gaithersburg, Maryland. The new machines will expand the Bureau's ability to calibrate force-measuring instruments precisely. The Bureau's present dead-weight machine, which has a capacity of 111,000 pounds, was installed in 1931.

Keuffel & Esser Company has announced the establishment of a new subsidiary branch, Keuffel & Esser of Colorado, Inc., in Denver, Colorado. K&E products were distributed exclusively by the Kendrick Bellamy Company in Denver. The new firm will retain the former address. Mr. John Harvey has been appointed as branch manager.

The announcement was made in SURVEYING AND MAPPING, December 1959, page 534, that Surveyors Service Company, 2021 South Grand Avenue, Los Angeles, California, had been appointed Western Distributor for all Wild surveying instruments. Further information, now available, shows that this distributorship covers nine States; California, Washington, Oregon, Arizona, Nevada, Idaho, Montana, Utah, and New Mexico. Six new dealers have been appointed by Surveyors Service Company to serve specified areas within the nine-State region served by the company.

A major link in the Canadian portion of the vast network of survey control of North America was completed this past season by a geodetic field party of the Department of Mines and Technical Surveys. Made at a point near Emerson, about 50 miles south of Winnipeg, it joins the network of survey control of western Canada with that of eastern Canada. The link at Emerson was established on the fiftieth anniversary of the Department's Geodetic Survey Division. The Division's first geodetic monument, a large cairn on the top of King Mountain, in what is now Gatineau National Park, was erected in 1909.

Among a number of other noncredit review courses offered by the University of Virginia, Division of Extension and General Studies, Northern Virginia Center, 1206 North Quincy Street, Arlington 1, Virginia, is the course, "Land Surveying Review" (Engr. 47.000), which will begin on April 11, 1960, meet Monday and Wednesday evenings from 7:00 to 9:00 p.m., and continue through 12 meetings. The instructiton will be given in Room 10, The University College (Bailey's Crossroads), and the fee will be $15.00. Prelimniary registration can be made by phone or mail. For further information, telephone JAckson 7-3125, JAckson 8-6660, or JAckson 2-9118.

A team of geophysicists from the Dominion Observatory was scheduled to carry out during the winter a six-week survey of the magnetic field over a million square miles of Canada's northlands to obtain data for magnetic charts of these regions. Using the Observatory's three-component airborne magnetometer, they proposed to fly, in all, about 35,000 air miles, including 12 flights of more than 2,000 miles each, over the central part of the Northwest Territories and Yukon between Baffin Island and Alaska and between 60° and 70° north latitude. One of the reasons this work was carried out in the winter was to take advantage of the good astro-navigation conditions provided by the long hours of darkness in the Arctic.

If your community, industry, or other organization is planning the construction of welfare or recreational facilities, you may find valuable guidance in a Navy publication on such activities which has just been released to the public through the Office of Technical Services, U. S. Department of Commerce. The report, PB 151980 *Special Service (Welfare and Recreation) Facilities,* Bureau of Yards and Docks, U. S. Navy, September 1953, may be ordered from the Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C. The report contains 62 pages and is priced at $1.75.

A new nautical chart, No. 270, Chatham Harbor and Pleasant Bay, Massachusetts, has been published by the Coast and Geodetic Survey. The new chart provides large scale coverage of an area hitherto shown only on coastal chart No. 1208 at the scale of 1:80,000. Chart 270 is published at the scale of 1:20,000 and adjoins chart No. 257 to the westward covering Chatham Roads at the same scale.

The Chicago headquarters of Fairchild Aerial Surveys, Inc., has been moved from 111 West Washington Street, Chicago 2, Illinois, to Daily News Plaza, Room 1904, 400 West Madison Street, Chicago 6, Illinois. Fairchild's European office has been moved from Geneva, Switzerland, to Rome, Italy, the new address being c/o Dr. Fedele Mazzucchelli, via Bradano 22.

The 1960 Gurley Ephemeris is now available to practicing surveyors and engineers and to instructors and students of surveying. Charts showing northern, southern, and equatorial stars

are included for the first time and are keyed to the tables in the Ephemeris. Obtainable from W. & L. E. Gurley, Troy, N. Y.

Specialized motion pictures about new products, advanced industrial processes, and cost-saving techniques are listed in a new revised edition of the "Business and Professional Film Catalog" just published by Modern Talking Picture Service, Inc., 3 East 54th Street, New York 22, N. Y. The films are available on free loan to technical groups, universities, business and professional audiences, and other groups with specialized interests. Copies of the illustrated catalog are being distributed free.

New three-dimensional maps of the World and of the United States have been published by Aero Service Corporation. Both of the 28- by 18-inch plastic maps show mountains and valleys in detailed relief that stands up nearly a half inch.

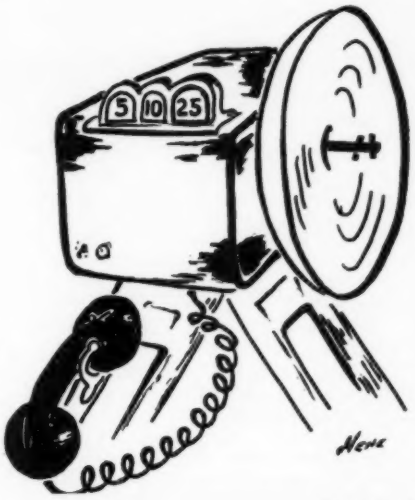
The detailed 50-State U. S. map shows 4,000 geographic names, including 2,000 cities and towns, 1,000 rivers and lakes, 150 national parks and monuments, over 200 mountain ranges and peaks, and other features. Its scale in 1 inch equals 117 miles. A 26- by 14-inch map index slides out from the back of the map and locates all of the place names shown. Like the map, this index is printed on vinyl plastic.

The companion World relief map features nearly 2,500 place names, including 1,200 cities and towns, 400 large bodies of water, 450 islands, mountain ranges and peaks, and many other features. All place names appear on a pull-out map index. The scale is 962 miles to the inch. Both maps are plastic coated to protect colors against dust, dirt, or fingerprints.

Jacob R. Sensibar, president of Construction Aggregates Corporation, Chicago, has been elected national president of the American Technion Society, a nationwide group composed of upwards of 15,000 engineers, scientists, technicians, and industrialists sponsoring the Technion—Israel Institute of Technology. The Technion, located in Haifa, opened its doors in 1924 with an enrollment of 32 students, in contrast to its present enrollment of more than 3,000. The article on "Relief Shading," by Pinhas Yoeli, SURVEYING AND MAPPING, June 1959, Vol. XIX, No. 2, pages 229 to 232, inc., prompted us to include this item. Sensibar has stated that "Israel is a country poor in natural resources, but rich in human resources, which can only be exploited to the fullest through engineering and applied science."

The first page of *P. G. and E. Progress* for November 1959 is devoted to setting forth the use of the Tellurometer by Aerial Control, Inc., on a control survey project for a 300-mile stretch of gas pipeline from the Oregon-California border to the San Francisco Bay area for Pacific Gas and Electric Company. This link is a part of a 1400-mile pipeline project to bring gas from western Canada to the Bay area.

First we heard of "Instant Postum," next it was "Instant Coffee," then came "Instant Tea," and now, believe it or not, we have received a release from the Goodyear News Service, replete with pictures and all, describing "Instant Concrete Pipe."



Gene Harris

NO COMMENT

Surveying and Mapping Conferences

The Fourth Annual Surveying and Mapping Conference, sponsored by The Utah Chapter of the American Public Works Association, the Civil Engineering Department of the University of Utah, and the Utah Section of the American Congress on Surveying and Mapping, was held on the campus of the University of Utah, Salt Lake City, Utah, December 7–8, 1959.

The Third Annual Land Surveyors Conference, was scheduled to be held at the University of Illinois, Champaign, Illinois, February 15–16, 1960. The proceedings of the Conference are to be published.

Official District of Columbia Highway Map

When the supply of such an item as the official highway map of the District of Columbia gets down to two (only half the recommended minimum for a popular brand of tablet for the relief of indigestion) that 'snooze—somebody must have been asleep at the switch.

But that is exactly the predicament in which the District of Columbia finds itself. However, the situation is to be remedied, and a new supply of 25,000 copies should be available for distribution in June 1960. It goes without saying that the new map will be a revision of the older ones, and, at the rate the street and highway pattern of the District of Columbia is being changed, this will be none too soon, and the 1960 edition will be most welcome.

This Service Lets You
SAVE DAYS and DOLLARS on SUBDIVISION COMPUTATIONS

Surveying and engineering firms throughout America are saving time, saving money and avoiding manpower bottlenecks, by having our Electronic Computing Service handle their subdivision computations. We've computed more than 10,000 lots, from Florida to Wisconsin—Massachusetts to New Mexico.

This service is COMPLETE, and the procedure is fast and simple:

1. You furnish a preliminary plan, a mathematically-closed boundary survey, and the lot specifications.

2. Working from this, we give you an *accurate large-scale drawing* of the subdivision, *complete with all data* for platting and staking—normally in 7 days—at a fee you'll appreciate. *All lots are checked to see that they meet your stated specifications.*

New brochure gives details. Ask for it—and let us quote on your next subdivision.

TECHNICAL ADVISORS, Inc.
Municipal Court Bldg., Ann Arbor, Mich.
Telephone Normandy 2-1159

Save with **Permanent** Copperweld® TRADE MARK **MARKERS**

- **PROTECT** your investment in the original survey—and protect yourself from troublesome disputes.
- **AT LITTLE COST** you can quickly and easily drive Copperweld* Markers and have permanent reference points. Bronze head can be center-punched and stamped for identification. If larger head is needed, a 4" adapter is available.

*Trade Mark

Furnished in any desired length—in multiples of 6 inches. Packed 10 markers to a carton.

CROWN METAL PRODUCTS CO.
WYANO, PA.

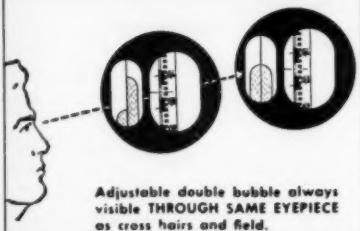
Write for Bulletin 144

SURVEYORS!

Save time

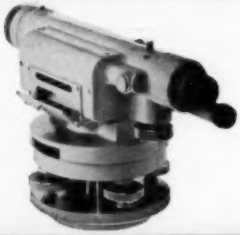
Save money

NEW LEVEL with



Adjustable double bubble always visible THROUGH SAME EYEPIECE as cross hairs and field.

DOUBLE BUBBLE



is "MISTAKE FREE"

- No need to turn telescope during leveling up
- American type—erecting eyepiece, 4 leveling screws
- Unbelievably fast and accurate, yet simple-to-use. Economical!

Write us for details

FENNEL

Fennel Instrument Corp. of America
50 Colfax Ave., Clifton, New Jersey

Wiley BOOKS

NEWLY REVISED

1. ELEMENTS OF CARTOGRAPHY

SECOND EDITION

By ARTHUR H. ROBINSON, *University of Wisconsin.* Concentrates on principles (rather than drafting mechanics) of map-making processes *after* data have been collected. Most factors are covered from the utilitarian viewpoint, and the formulas used are for small-scale cartography. They can also be extended to the large scale. The book is now much larger, with about 70 new illustrations.

EIGHT MAJOR CHANGES, ADDITIONS

- New chapter on map projection
- Added material on symbolization, representation
- Gives cartographers' basic statistical techniques
- Topics greatly reorganized for clarity
- Includes tables of logarithms
- Offers a proof of Tissot's Law of Deformation
- Up-to-date material on reproduction methods, scribing, etc.
- Explains, illustrates new method of landform drawing

1960 • 343 pages • $8.75

2. ELEMENTARY SURVEYING
Vol. I of Principles and Practice of Surveying

9th EDITION

By the late C. B. BREED. *Revised with assistance of* A. J. BONE, *M.I.T. 1958. 717 pages. $6.50*

TRIAL ORDER

JOHN WILEY & SONS, Inc.
440 Park Ave. South, New York 16, N. Y.

SM 30

1 2 Send books circled on 10 days' approval. Within 10 days of receipt I'll remit price plus postage or return books postpaid.

Name .....

Street .....

City ..... Zone .... State .....

☐ Check here to save postage. Send full amount with order and we pay postage. Same return privilege.

THE BRUNTON* POCKET TRANSIT

IT'S HANDY...
weighs only 9 oz.; 2¾" x 3" x 1⅛"; easy to carry in pocket, on belt, in car.

IT'S VERSATILE...
ideal for preliminary and supplementary surveying; used as a compass, transit, level, plumb, alidade, clinometer. Shows direction to 1°; level, slope or grade within 1°.

IT'S MADE TO LAST A LIFETIME
"Over 60,000 Brunton Transits since 1896"
See your local engineering supply house or WRITE FOR CATALOG
**Brunton is a registered trademark of*

WM. AINSWORTH & SONS, INC.
2151 LAWRENCE ST. • DENVER 5, COLORADO

FOR SURVEY AND OCEANOGRAPHIC WORK
"SERVING THE GULF, CARIBBEAN AND ATLANTIC"
Modern, air-conditioned, steel, diesel-powered craft, especially designed for surveying and geophysics. Contact us for locations and availability.
State Boat Corporation
P. O. Box 543 HOUSTON, TEXAS Telephone MAdison 3-0340

1959-1963 F.I.G. Bureau

Following the Ninth International Congress of Surveyors in Holland in 1958, the host-country Bureau of the Federation Internationale des Geometres (FIG), through the offices of outgoing President Prof. R. Roelofs and outgoing Secretary General Prof. Ir. W. Baarda of the Netherlands, announced in September 1959 the new officers and secretariat of the 1959–1963 FIG Bureau that will host the Tenth International Congress of Surveyors in 1961 in Vienna, Austria, as follows:

President—Dipl.-Ing. Dr. F. Schiffmann (Austria).

Vice Presidents—Dipl.-Ing. G. Hollhuber (Austria), Prof. R. Roelofs (Holland), On. Dr. Geom. D. Chiaramello (Italy).

Secretary General—Prof. Dr. A. Barvir (Austria).

Secretary Administrator—Dipl.-Ing. O. Stoier (Austria).

Treasurer—Dipl.-Ing. W. Kamenik (Austria).

The address of the new FIG Secretariat is: Krotenthallergasse 3, Vienna 8, Austria. Telephone: Vienna 334631. Telegraph: F.I.G. Vienna.

AMERICAN AIR SURVEYS, INC.
Nationally-known photogrammetrists specializing in
TOPOGRAPHIC AND PLANIMETRIC MAPS
Land Surveyors invited to inquire about AMERICAN'S cooperative plan
for brochure write
907 Penn Ave. Pittsburgh 22, Pa.

Ninth International Congress of Photogrammetry London — 1960

The Ninth International Congress of Photogrammetry is to be held in London from the 5th to the 17th of September, 1960, under the auspices of the International Society for Photogrammetry. The Congress is being held at the invitation of the Councils of The Royal Institution of Chartered Surveyors and the Photogrammetric Society. Departments of Her Majesty's Government concerned with photogrammetry have welcomed and are participating in the holding of the Congress in London.

The International Society for Photogrammetry, to which learned societies and scientific bodies from 30 countries now adhere, is devoted to progress in a science which has many unsuspected bearings upon everyday life. Photogrammetry means measurements on photographs and their interpretation. It was originally conceived about 1840 as a means of surveying the land by photography taken from high places. Aerial photographic surveys were first made from a balloon and continue today using aircraft and rockets. New techniques and scientific instruments for use in photogrammetry are constantly being devised and developed, and many of these will be discussed and displayed at the Congress.

Photogrammetry is now extensively used throughout the world for reconnaissance and mapping in order to provide information essential to orderly terrestrial development, defense, domestic and other works. In addition to this, photogrammetry is increasingly used in a wide variety of other fields, such as agriculture, archaeology, architecture, criminology, forestry, geology, medicine and surgery.

1960 will be the first time the Congress has been held in the United Kingdom, earlier Congresses, the first in 1913, having been held in Vienna, Berlin, Zurich, Paris, Rome, The Hague, Washington, and Stockholm. The Congress has been fortunate in securing fine accommodation in the University of London for its proceedings which, in addition to plenary and technical sessions, will include an exhibition of equipment and techniques by some of the world's foremost instrument manufacturers and operating companies.

The organization of the Congress is in the hands of a Congress Board, composed of representatives of the Royal Institution of Chartered Surveyors, the Photogrammetric Society, and the National Committee for Photogrammetry, under the Chairmanship of the President of the International Society for Photogrammetry, Major General R. Ll. Brown, C.B., C.B.E., F.R.I.C.S., formerly Director General of the Ordnance Survey of Great Britain, who is this year President of the Photogrammetric Society in London.

At a recent meeting of the Board, Colonel J. B. P. Angwin, M.B.E., F.R.I.C.S., sometime Deputy Surveyor General of India, then Chief Executive Officer, Festival of Britain, 1951, and lately Research Associate in Cartography at the Ohio State University, was appointed executive Congress Director. Communications should be addressed to him at 18, Cavendish Square, London, W.1.

APPLICATION FOR MEMBERSHIP

I am interested in surveying and mapping and hereby apply for membership in the American Congress on Surveying and Mapping. I enclose $5.00 (U. S. and Possessions), $6.00 (Foreign) in payment of annual dues.

Name (Please type or print) .....

.....

Mailing Address .....

.....

Occupation and Organization .....

.....

Branches of surveying and mapping preferred .....

.....

Reference. If registered, please indicate .....

.....

Applicant's Signature ..... Date .....

(Send to: Chairman, Membership Committee,
905 Washington Bldg., 1435 G St., N.W., Washington 5, D. C.)

Reprints of Articles

Reprints in quantities of 50 or more may be obtained of any article appearing in this issue. Orders must be placed with the Editor-in-Chief, Howard S. Rappleye, 6712 4th St., N.W., Washington 12, D. C., not later than 3 weeks after publication. Authors who wish reprints of their articles may so indicate when manuscripts are submitted. Approximate prices of reprints follow:

	Without Covers						
Number	*4 pp.*	*8 pp.*	*12 pp.*	*16 pp.*	*20 pp.*	*24 pp.*	*Covers**
50	$13.50	$22.50	$34.00	$36.00	$47.50	$56.50	$11.10
100	$14.00	$23.50	$35.50	$37.50	$49.50	$59.00	$13.40
Add'l 100s	$ 1.15	$ 2.00	$ 3.15	$ 3.15	$ 4.30	$ 5.25	$ 4.50

* Heavy paper cover—over and above the cost of reprints without covers.

MAPPING

p in
and

....
....
....
....
....
....
....
....
....
....
....

ear-
d S.
eeks
cate

rs*
0
0
0